



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

ICS2022-IND
October 31, 2022

Sovereign-Backed Financing

Project Document

P000370 Republic of India: Haryana Orbital Rail Corridor Part A Project

Currency Equivalents

(As at date, October 31, 2022)

Currency Unit – Indian Rupee (INR)

INR1.00 = USD 0.012

USD1.00 = INR 82.409

Borrower's Fiscal year

April 1 - March 31

Abbreviations

AIB	Asian Infrastructure Investment Bank
CAG	Comptroller and Auditor General
DEA	Department of Economic Affairs
DFC	Dedicated Freight Corridor
DFCCIL	Dedicated Freight Corridor Corporation of India Limited
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
EIRR	Economic Internal Rate of Return
EPC	Engineering Procurement Construction
ES	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
ESS	Environmental and Social Standard
FIRR	Financial Internal Rate of Return
FM	Financial management
FY	Fiscal Year
GC	General Consultant
GAP	Gender Action Plan
GBV	Gender-based violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoH	Government of Haryana
GoI	Government of India
GRM	Grievance Redress Mechanism
HDNs	High-Density Networks
HORC	Haryana Orbital Rail Corridor
HORCL	Haryana Orbital Rail Corporation Limited
HRIDC	Haryana Rail Infrastructure Development Corporation Ltd.
INR	Indian Rupee
IR	Indian Railways
JV	Joint Venture
LRP	Livelihood Restoration Plan
km	Kilometers
kmph	Kilometers per hour
KRCL	Kutch Railway Company Limited

MDB	Multilateral Development Bank
MoR	Ministry of Railways
NCR	National Capital Region
NCT	National Capital Territory
NPV	Net Present Value
O&M	Operation and Maintenance
OHE	Overhead equipment
PPM	Project-Affected People's Mechanism
PPP	Public Private Partnership
PSU	Public Sector Undertaking
PWDs	Persons with disabilities
RDSO	Research Designs and Standards Organization
RP	Resettlement Plan
SEP	Stakeholder Engagement Plan
S&T	Signaling and Telecommunication
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation and Abuse
SHE	Safety, Health and Environment
SIA	Social Impact Assessment
SPV	Special Purpose Vehicle
ToR	Terms of reference
USD	United States Dollar
WACC	Weighted Average Cost of Capital

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1. Summary Sheet

Project No.	000370A
Project Name	Haryana Orbital Rail Corridor (HORC) Part A Project
AIIB Member	Republic of India
Borrower	Republic of India
Project Implementation Entity	Haryana Rail Infrastructure Development Corporation Ltd (HRIDC)
Sector	Transport
Sub-sector	Rail (non-urban)
Project Objective	To contribute to improving rail connectivity in the National Capital Region and partially decongesting the rail corridor in Delhi.
Project Description	<p>The Haryana Orbital Rail Corridor (HORC) Part A project (the project) comprises 29.5 kilometers (km) electrified dual-track railway line passing through Nuh and Gurugram districts in the state of Haryana. It includes civil works, electrification, signaling and telecommunications, 5 new railway stations and 15.6 km route connectivity to Indian Railways (IR) and Dedicated Freight Corridor (DFC) at three interchange points.</p> <p>The project is one of two parts (incl. Parts A and B) under the proposed HORC investment program (the program) from New Prithla to New Harsana Kalan. The entire HORC program comprises 125.98 km of new railway line from chainage km 0.0 to km 125.98, 17 new railway stations, and 21.89 km of connectivity lines to the IR and DFC at six points, totaling 147.87 km.</p> <p>The project will finance two components, as described below.</p> <p>Component 1 – Construction of 29.5 km of HORC and 15.6 km route connectivity, from chainage km 32 to km 61.5, including civil works (earthwork, bridges, 5 stations buildings, retaining walls, and other miscellaneous works) and design, supply, installation, and testing and commissioning of high-rise overhead equipment (OHE), general electrical services and signaling and telecommunication (S&T) and laying of new broad gauge double railway track.</p> <p>Component 2 – Provision of General Consultancy (GC) services and other consultancy services for the HORC program to support HRIDC in: (a) overall program planning, management, coordination and</p>

	monitoring; (b) preparation and implementation of the Part A investment project; and (c) preparation of Part B investment (including e.g., geological survey, detailed engineering design, tender documents), which will enhance implementation readiness of Part B.
Implementation Period	Start Date: October 30, 2022 End Date: June 30, 2026
Expected Loan Closing Date	December 31, 2026
Cost and Financing Plan	Project cost: USD 277.83 million <u>Financing Plan:</u> AIIB loan: USD 128.00 million (46 percent) Haryana Orbital Rail Corporation Limited: USD 149.83 million (54 percent)
Size and Terms of AIIB Loan	Size: USD 128.00 million Terms: Final maturity of 29.5 years, including a grace period of 10 years, at AIIB's standard interest rate for sovereign-backed loans.
Environmental and Social Category	A
Risk (Low/Medium/High)	Medium
Key Covenants	Furnish to the AIIB, no later than April 30 of each year until the completion of the project, an annual work plan and budget for the project for the following Fiscal Year; and implement the activities under the project during the relevant Fiscal Year in accordance with such a plan and budget for the duration of AIIB loan financing.
Retroactive Financing (Loan % and dates)	Eligible expenditures incurred, not more than 18 months before the signing date of the loan agreement, for an amount of up to 20 percent of the loan amount.
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that AIIB is in compliance with the policies applicable to the Project.
Economic Capital (Ecap) Consumption	USD14.20 million (13.96 percent)

President	Jin Liqun
Vice President	Urjit Patel
Director General	Rajat Misra, INF 1
Team Leader	Wenyu Gu, Senior Investment Operations Specialist
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2. Project Description

A. Overview

1. **Background.** India has the fourth-largest railway system in the world. However, it has been plagued with issues such as lack of rail freight capacity and poor service quality over the last decades.¹ The Ministry of Railways (MoR) has identified seven high-density networks (HDNs) within Indian Railways (IR),² all of which have reached or exceeded capacity. Despite comprising only 18 percent of the route kilometers in the IR network, these HDN lines carry over 70 percent of the network's passenger and freight traffic. Of the seven routes, four originate and/or terminate in the National Capital Region (NCR).³

2. Currently, the rail network in the NCR operates as a transit point for passenger and freight volumes moving between Haryana, Punjab, Rajasthan on the one side and the rest of the country on the other side. Through freight traffic also needs to pass through the NCR area, in particular Delhi, thereby utilizing capacity on saturated lines that could be used for local or locally destined traffic.

3. **Traffic in Delhi.** The train movements in Delhi are merged from eight radials, which handle tremendous volumes of passenger and freight traffic. Growth in passenger and freight has already adversely affected day-to-day train operations due to the frequent addition of new trains.⁴ The current average speed of goods trains in the Delhi area is about 17 kilometers per hour (kmph). The average speed of passenger trains is about 46 kmph.⁵ Almost all railway lines carrying through traffic (not destined) to Delhi are close to or above their saturation levels. Most of the existing traffic runs North to South and vice versa, although some trains also move from East to West and vice versa via New Delhi. More details can be found in Annex 2.

4. **Rationale.** Further augmentation of rail line capacity and throughput for congested sections in Delhi is not possible due to basic infrastructural constraints at the existing terminals. Moreover, these congested sections pass through urban areas making the expansion of existing sections logistically prohibitive and costly.

5. Given the expanding passenger traffic, congestion issues on most rail lines in and out of Delhi, and an interest to increase the use of rail in freight transport (compared to less energy-efficient and carbon-intensive transport modes such as roads), IR is looking for ways to increase rail capacity by optimizing operations and expanding

¹ MoR has been working on a number of railway reforms to address these issues, including incentivizing the use of rail in freight services, liberalizing the usage of private sidings, allowing passenger trains to transport private non-railway parcels, and digital improvements in logistics services.

² Indian Railways is the sole railway operator in India. It operates about 68,000 route-kilometers and employs about 1.25 million staff annually. The railway maintains a fleet of over 12,000 locomotives, 76,500 passenger coaches, and nearly 300,000 freight wagons.

³ The NCR covers Delhi, the capital of India, and several districts surrounding the states of Haryana, Rajasthan, and Uttar Pradesh.

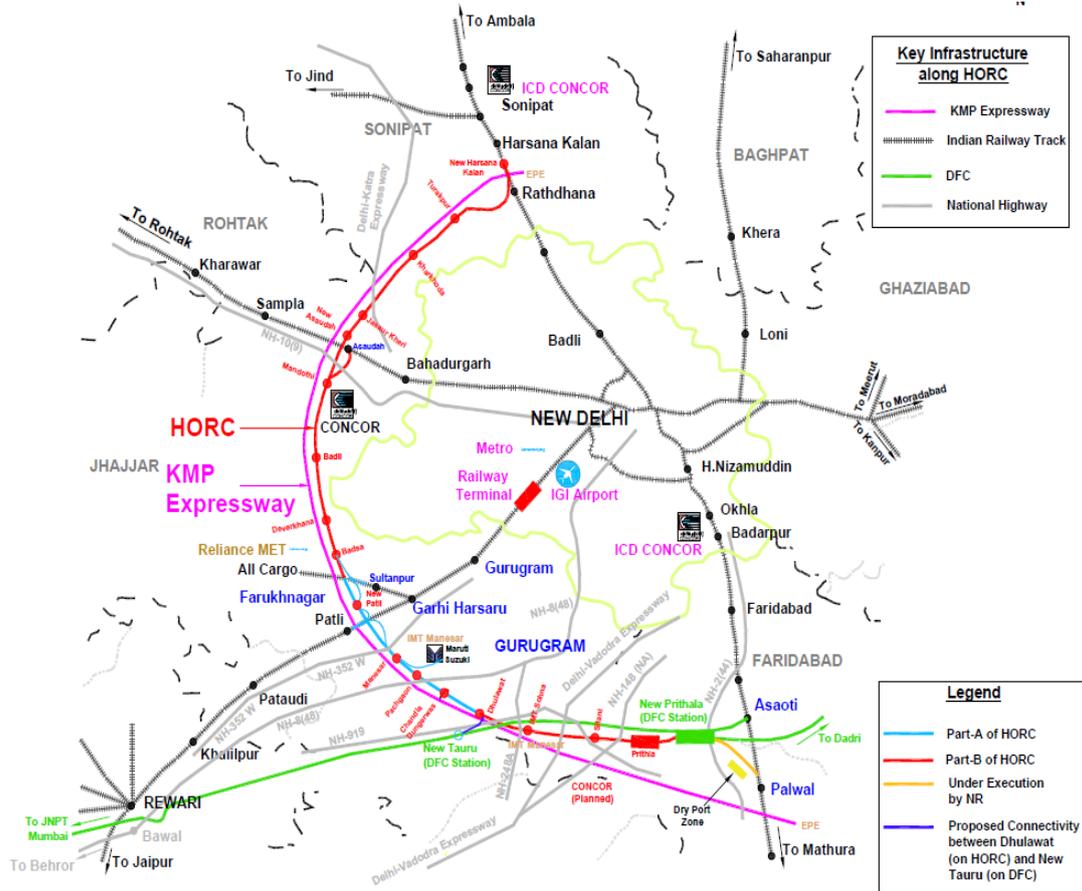
⁴ Based on information received from Delhi division of IR, annual growth of passenger traffic is 2%, while freight traffic growth is 18%.

⁵ Data from Delhi division of IR through HRIDC.

infrastructure in partnership with the State of Haryana and the MoR through the Haryana Orbital Rail Corridor (HORC).

6. The HORC investment program (the program, see Figure 1) comprises the construction of 125.98 kilometers (km) of greenfield railway line with 17 new railway stations and 21.89 km of connectivity lines to the Indian Railways (IR) network and Dedicated Freight Corridor (DFC) at six interchange points, totaling 147.87 km.

Figure 1: HORC Program Alignment



7. The concept of the HORC program was outlined in the Regional Plan 2005 – 2021 for the NCR prepared by National Capital Region Planning Board (NCRPB). The HORC was proposed again in the report prepared by Haryana Department of Town and Country Planning in 2010 titled Preparation of Sub-regional Plan for Haryana Sub-region of NCR. Furthermore, the Functional Plan on Transport for National Capital Region (2032) highlighted the importance of developing the HORC. Once constructed, the HORC essentially bypasses Delhi and provides increased transport capacity for through traffic coming from north-south and west-east of India. In doing so, this decongests the freight traffic within Delhi, by shifting through freight traffic to the Orbital and enables more passenger trains to use the existing Delhi rail network for travel with origins and destinations in Delhi. Moreover, HORC serves to increase rail capacity throughout Haryana and contributes to the commuting needs of the people of Haryana and the freight transport needs of industrial and logistical parks.

8. **Program Objective and Results.** To improve rail connectivity in the National Capital Region and decongest the rail corridor in Delhi. The assessment of the

program's benefits is presented in Section 3B–Economic and Financial Analysis. At completion, the program's results will be assessed and monitored using key indicators highlighted below:

- (i) Average travel time saved per trip by freight using HORC, compared to original IR Route (from Palwal to Harsana Kalan)
- (ii) Freight traffic diverted from original IR route to HORC
- (iii) Number of passengers carried
- (iv) Percentage of vulnerable (female, elderly, disabled) passengers in User Survey satisfied or very satisfied with station facilities and services

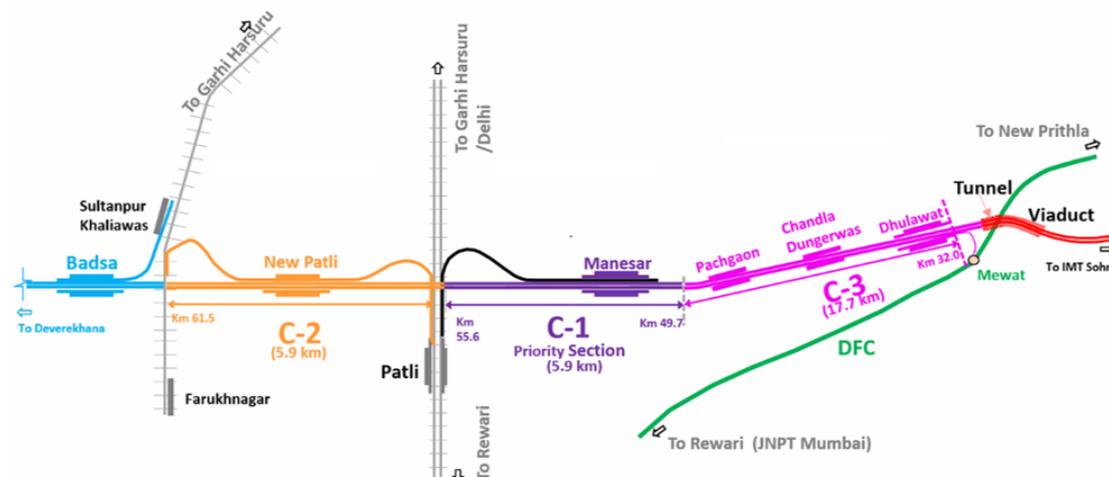
9. Based on the implementation readiness criteria of the Ministry of Finance⁶, and the program's complex technical nature, and six connection points to the IR network, the HORC program will be implemented through two Parts:

- (i) Part A: (a) Construction of 29.5 km of HORC and 15.6 km route connectivity lines⁷, from chainage km 32 to km 61.5 (see Figure 2); and (b) Consultancy services for overall HORC program management and preparation of Part B investment. Part A will provide early connectivity to the IR network at Patli by end-2022 and Sultanpur by end-2023.
- (ii) Part B: Construction of 96.48 km of HORC and 6.28 km route connectivity lines, from chainage km 0.0 to km 32 and km 61.5 to km 125.98. Part B is expected to link the program with IR at three points by June 2025.

10. **Project Description.** The Haryana Orbital Rail Corridor (HORC) Part A Project (the project, see Figure 1), comprises 29.5 km electrified dual-track railway line passing through Nuh and Gurugram districts in the state of Haryana. It includes civil works, electrification, signaling and telecommunications, 5 new railway stations and 15.6 km route connectivity lines to IR and DFC at three points.

⁶ At least 50% of land acquisition completed and 30% of the project cost (or the first phase) are awarded.

⁷ The connectivity lines will connect the project to three interchange points at Sultanpur/Farukhnagar IR line, Patli IR line, and DFC line at New Tauru (near Mewat).

Figure 2: Project Alignment (Part A of HORC Program)

11. Haryana Rail Infrastructure Development Corporation Limited (HRIDC)⁸, an umbrella Joint Venture Company of Ministry of Railways (MoR) and Government of Haryana (GoH), joined hands with a number of entities (Haryana State Industrial and Infrastructural Development Corporation (HSIIDC), Gurugram Municipal Development Authority (GMDA), Maruti Suzuki India Limited (MSIL), All Cargo Logistics Limited (ACL)) with an aim to incorporate a limited liability company, Haryana Orbital Rail Corporation Limited (HORCL)⁹. The purpose of setting up HORCL is the development, construction, operation, and management of the proposed project. HRIDC is the project implementation agency to implement the project through a construction agreement signed between HORCL and HRIDC on February 16, 2022.

12. AIIB will finance the general consultant and approximately 75 percent of the civil works, electrification, signaling & telecommunication, laying of new broad gauge double railway lines. HRIDC will finance the remaining 25 percent of works and other activities, including rails and sleepers, as well as costs associated with land acquisition, resettlement and contingencies.

13. **Project Objective.** To contribute to improving rail connectivity in the NCR and partially decongesting the rail corridor in Delhi.¹⁰

14. **Expected Results.** The project results will be monitored using key indicators. These are elaborated in Annex 1, while selected indicators are highlighted below.

⁸ The Government of Haryana (GoH) and Ministry of Railways (MoR) have equity participation of 51% and 49%, respectively, in HRIDC. HRIDC was incorporated in August 2017 and its mandate is to identify, develop, arrange for financing, and implement bankable railway projects in the State of Haryana.

⁹ HORCL, a special purpose vehicle, was incorporated in December 2019 to undertake HORC project development. The shareholders of HORCL include three public sector undertakings (PSUs) and two equity investors. The PSUs include HRIDC (55.4%), Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) (19%) and Gurgaon Metropolitan Development Authority (GMDA) (5%). The private sector stakeholders include Maruti Suzuki India Limited (MSIL) (13%) and All Cargo Logistics Limited (ACL) (7.6%). The shareholder agreement of HORCL was signed on December 20, 2021, with an equity contribution of USD200,70 million (INR 1500 Crores) to the HORC project.

¹⁰ This project renders support to the overall HORC program objective of improving rail connectivity in the NCR and decongesting the rail corridor in Delhi.

- (i) Kilometers constructed
- (ii) Installation of solar roof panels at each station (climate resilience/adaptive measure)
- (iii) Gender-friendly and accessible designs in stations
- (iv) Gender-based violence (GBV) / Sexual Exploitation and Abuse (SEA) orientations conducted for civil works employees as per the Gender Action Plan (GAP)

15. **Expected Benefits and Beneficiaries.** The project will provide additional capacity for the existing railway network in NCR and contribute to decongesting the rail corridor in Delhi by diverting traffic not meant for Delhi once the HORC program is completed. In addition, the project is expected to help spur the development of industrial plants and multi-modal logistics hubs in the NCR region of Haryana. These businesses will benefit from shorter travel times and a cleaner and more reliable rail system compared to road transport. Indirect benefits include improved access to goods and services for communities and businesses dependent on raw inputs. As the capacity of the railway infrastructure dedicated to freight movements is increased, the resulting additional speed, volume and reliability of service will enhance opportunities for the development of activities based on logistics and will reduce the cost of doing business for the existing and future companies that are in the area. The communities along the project alignment will also benefit from access to jobs during the construction phase as well as employment generated by nearby logistics hubs and industrial areas. Transport passengers, including women, the disabled, and the elderly, will also benefit from more efficient, safer, reliable, and vulnerability-friendly transport services compared to the congested IR and other road-based public transport modes.

B. Rationale

16. **Strategic fit for AIB.** The project is aligned with AIB's thematic strategies as follows:

- (i) **Transport sector strategy and the thematic priority on connectivity:** The project will increase the transport capacity of the railway network in NCR, and ease pressure on the Haryana Road network through shifting road traffic to the railways. The improved freight transport conditions may spur additional economic and social activities in Haryana. Furthermore, the project will connect with the IR and DFC networks at three interchange points, thereby linking major industrial and logistic hubs in the NCR region. Finally, the project contributes to the HORC program's objective of easing traffic bottlenecks on the Delhi railway through shifting rail traffic from the inner ring rail network to the peripheral network.
- (ii) **Thematic priority on green infrastructure:** The proposed railway project is a clean mode of transportation that is expected to result in a net reduction in Greenhouse Gas (GHG) emissions and local air pollution. This will be achieved through a modal shift from a carbon-intensive transport mode (i.e., roads) to a low-carbon electrified railway line. Since the project provides

electric traction, expected benefits include: (i) reduced fossil fuel consumption as electric-powered engines are not dependent on a single energy source and energy can be sourced from various sources such as renewable energy;¹¹ (ii) a regenerative braking feature since the train's kinetic energy can be converted into electrical energy, thereby resulting to energy savings of up to 20 percent compared to conventional brakes.¹² The project is also expected to increase the climate resilience of the railway infrastructure.

- (iii) **Digital infrastructure strategy and the thematic priority on technology-enabled infrastructure:** The proposed project design and operation will include technological features that will improve the climate resilience of the project, such as provision of rainwater harvesting structures and solar panels in station roofs.

17. **Value addition by AIIB.** The Bank has assumed an important role in the project preparation stage as the implementing entity is dealing with a Multilateral Development Bank (MDB) for the first time. The support provided to the client covers several areas including technical, procurement, environmental and social (ES). AIIB's participation has strengthened the project by:

- (i) Using a chainage-wise work program to visualize and optimize the project preparation and implementation. The finalized work program is used as the baseline for overall project preparation and will be updated periodically.
- (ii) Reviewing the cost estimate thoroughly and ensuring all potential costs, such as the GC, other consultant services, contingency, and price escalation, are fully considered.
- (iii) Providing continued hands-on support to HRIDC in preparing ES documents to enhance its capacity to adhere to AIIB ES requirements.
- (iv) Assisting HRIDC in the procurement strategy and tender documents preparation process from technical and procurement aspects.
- (v) Providing substantive inputs to project design by incorporating technologies that mitigate and adapt to climate change (e.g., solar panels and rainwater harvesting structures at stations, construction of side drains where the railway formation is in cuttings).
- (vi) Developing a GAP that addresses the needs of vulnerable groups in project preparation, design and implementation.

¹¹ Indian Railways, in charge of O&M of the HORC program, established the Mission Electrification program in November 2016 and has a goal to shift from use of diesel to fully electrifying its railway tracks by December 2023. It is committed to changing its mix of energy sources from fossil fuel to renewable energy, including wind, solar, natural gas and waste-to-energy. Decarbonization initiatives include installation of wind generation and solar power plants that are either operational or planned and are/will directly supply power to Indian Railways. For more information, see: [Mission 41K.pdf \(indianrailways.gov.in\)](#).

¹² For more information, see: [Mission 41K.pdf \(indianrailways.gov.in\)](#).

18. **Value addition to AIIB.** The project will be the first time for AIIB to finance a greenfield railway standalone project, which will: (i) strengthen the Bank's expertise in financing large scale, technically complicated transport projects; (ii) enhance AIIB's experience in financing high-demand, long-distance railway projects in India and the region; and (iii) help develop a close institutional partnership between AIIB and HRIDC, further consolidating AIIB's status as a reliable development partner.

19. **Lessons learned from previous projects.** The project team has leveraged the experience from previous railway, metro and transport projects. Lessons incorporated into the proposed project include the following:

- (i) Engage ES consultants as part of preparation of the Environmental and Social Impact Assessment (ESIA) and Resettlement Plan at an early stage to mitigate potential risks and adverse impacts of the project.
- (ii) Engage a GC with MDB-financed project experience to enhance the implementation capacity of the implementing entity.
- (iii) Identify major public utilities, including electric lines, water pipes and telephone cables, and initiate the utility shifting plan before commencement of the project's civil works to minimize delay risk.
- (iv) Streamline the roles of organizations associated with the project (i.e., HRIDC as the implementing entity and HORCL as the special purpose vehicle (SPV)), through a construction agreement and a shareholding agreement and clearly outlined funds flow structure for smoother project implementation.
- (v) Incorporate project station design features that are climate adaptive and responsive to the needs of vulnerable groups (elderly, women, people with disabilities (PWDs)) to improve safety and overall passenger experience.

C. Components

20. The project is estimated to cost USD277.83 million, of which USD128.00 million will be financed by the Bank. The project cost and financing plan are in Table 1. The project includes the following:

- (i) **Component 1** – Construction of 29.5 km of HRC and 15.6 km route connectivity lines, from chainage km 32 to km 61.5, including civil works (earthwork, bridges, 5 stations buildings, retaining walls, and other miscellaneous works) and design, supply, installation, and testing and commissioning of high-rise overhead equipment (OHE), general electrical services and signaling and telecommunication (S&T) and laying of new broad gauge double railway track.
- (ii) **Component 2** – Provision of General Consultancy (GC) services and other consultancy services for the HRC program to support HRIDC in: (a) overall program planning, management, coordination and monitoring; (b) preparation and implementation of the Part A investment project; and (c)

preparation of Part B investment (including e.g., geological survey, detailed engineering design, tender documents), which will enhance implementation readiness of Part B.

D. Cost and Financing Plan

21. The indicative costs and financing plan for the project (Part A of HORC program) are outlined below in Table 1.

Table 1: Project Cost and Financing Plan (USD million)¹³

Item	Cost	Financing	
		AIBB Amount	HORCL Amount
Component 1 – Construction of 29.5 km of HORC and 15.6 km route connectivity lines.	158.51	118.05 (74.3%)	40.46 (25.7%)
Component 2 – Provision of General Consultancy and other consultancy services.	10.84	9.63	1.21
Land Acquisition	67.26	-	67.26
Utility Shifting	7.88	-	7.88
Front end fee	0.32	0.32	-
Interest during construction	15.69	-	15.69
Contingencies at 1% (for unforeseen changes on Component 1)	1.59	-	1.59
Cost escalation at 3% per annum	15.74	-	15.74
Total	277.83	128.00	149.83

22. **Counterpart funding sources.** Counterpart funds will come from the equity of HORCL shareholders. There are five shareholders of HORCL (project specific SPV): three public sector undertakings (PSUs) and two equity investors. The PSUs are HRIDC (55.4 percent), Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) (19 percent) and Gurgaon Metropolitan Development Authority (GMDA) (5 percent). The private sector stakeholders are Maruti Suzuki India Limited (MSIL) and All Cargo Logistics Limited (ACL) which collectively hold a 20.6 percent stake. The Shareholder Agreement has been signed. The HORCL's Board of Directors has approved the shareholder detailed equity infusion schedule in March 2022. The equity contribution stands at USD 200.70 million for the HORC program.

E. Implementation Arrangements

23. **Implementation period.** The project implementation period will span from October 30, 2022, to June 30, 2026.

24. **Implementation readiness.** The project has an existing implementation entity with clear roles and responsibilities. The GC has also been hired to support the project implementation and augment the institutional capacity of the implementation entity. A procurement plan is in place and procurement of contract packages are ongoing, with three contracts already awarded. The provision of counterpart funds for project

¹³ For reference, the HORC program is estimated to cost USD833.35 million. Part A comprises one-third of the cost of the program.

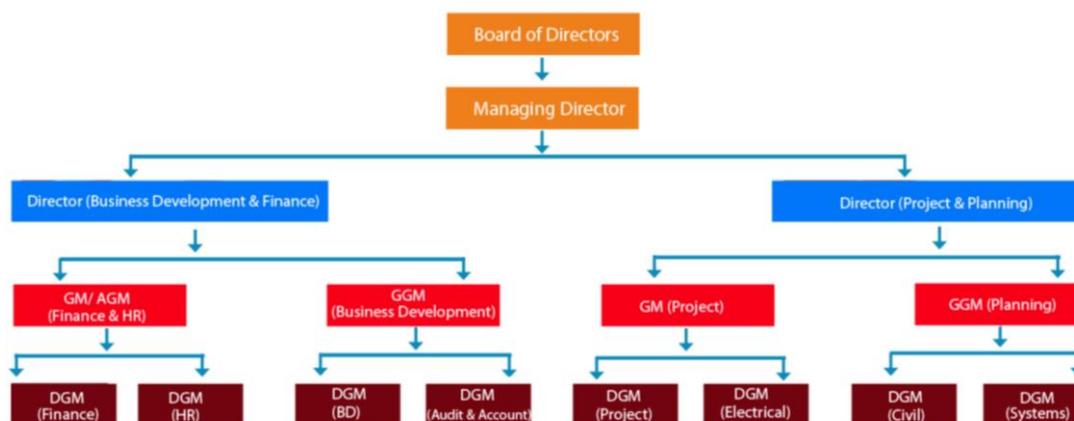
implementation, including on land acquisition, is also confirmed. Approvals for utility shifting are obtained and utility shifting activities are ongoing. An environmental and social impact assessment (ESIA) and a Resettlement Plan (RP) has been prepared and disclosed on AIIB and implementation entity's websites.

25. **Implementation management.** HRIDC is the implementing entity of the project. Overall project implementation responsibilities have been delegated to HRIDC by HORCL through an agreement signed on February 16, 2022. Details of the relationship between HRIDC and HORCL are provided in Annex 2.

26. HRIDC has a well-defined organizational management structure (see Figure 3 below) with clear roles and responsibilities, headed by a managing director with extensive metro and rail project experiences. Supporting the managing director are two directors, Director for business development and finance, Director for project and planning, and their team.¹⁴ For convenient project management, HRIDC has established a project management office in Gurugram, Haryana in December 2019. HRIDC comprises staff (a total of 52 full-time personnel) with expertise in various fields including civil engineering, electrical engineering, systems management, signaling and telecommunications, financial management, procurement, and project management. To support project implementation and augment HRIDC's institutional capacity, ES consultant and GC with terms of reference (ToR) agreed by the bank team, were brought on board in November 2020 and April 2021 respectively. Other consultants, including consultants for detailed design, and geological survey, are also on board.

27. HRIDC board of directors is chaired by the Chief Secretary of the GoH and holds a minimum of four meetings a year to review the project's progress. Once the project starts construction, the board meeting will be held quarterly to check the project's physical and financial progress regularly.

¹⁴ Managing Director is a nominee of both MoR and GoH. Director for business development and finance is a nominee of GoH and Director for project and planning is a nominee of MoR.

Figure 3: Organizational Structure of HRIDC

GGM=Group General Manager, GM=General Manager, AGM=Additional General Manager, DGM=Deputy General Manager

Source: HRIDC

28. **General Consultant (GC).** To support the HOCR program implementation and augment HRIDC's institutional capacity, the GC, with ToR, qualifications and experience agreed with AIIB, was onboarded in April 2021. 27 experts out of planned 144 consultants are in place since March 2022 to support HRIDC in project preparation and implementation. The GC acts as the Employer's Engineer and its tasks include the following: critical study of detailed project report (DPR); project management and monitoring; preparation of procurement strategy, tender documents and bidding process management; contract management including proof-checking designs, drawings, technical proposals and specifications to ensure system integration and interface management and supervision of civil infrastructure works; testing, trials, statutory approvals and commissioning of HOCR; capacity building of HRIDC; support during O&M phase and defect liability period; ensuring social and environmental safeguards compliance in accordance with the national and state government's legal framework and AIIB's E&S policy; other services such as preparation and implementation of quality assurance plan, stakeholder engagement plan and safety, health and environment plan and supporting HRIDC on project monitoring and financial management and disbursement activities.

29. **Other consultants.** Apart from the GC, other consultants were also engaged to strengthen HRIDC's capacity and accelerate overall HOCR implementation readiness, including on detailed design for structures such as the tunnel¹⁵, geological/geo-technical investigations, ESIA, and E&S monitoring.

30. **Monitoring and Evaluation.** The overall responsibility for monitoring project results will be with HRIDC, supported by the GC. HRIDC will produce monthly or quarterly progress reports, which will be one of the main means of monitoring project implementation. These reports, which will be shared with AIIB, will highlight the status of achievement of agreed targets for monitoring indicators (see Annex 1 for details) and detail project implementation progress. HRIDC is planning to design and operationalize an enterprise resource planning software to streamline the monitoring processes of its

¹⁵ Tunnel construction is part of Part B of HOCR program.

various projects, including this project. Technology may also be leveraged to monitor the ongoing construction activities including closed-circuit television (CCTV) cameras, drone's imagery, and satellite images.

31. **Project agreement.** AIIB will enter into a Project Agreement with HRIDC, HORCL and the State of Haryana. The Project Agreement will set out the implementation responsibility (i.e., financial management, procurement, E&S, reporting obligations) of HRIDC as the Project Implementing Entity. Details are being worked out now.

32. **AIIB's Implementation Support.** The Bank plans to conduct two field visits per year to monitor progress. In addition to undertaking biannual visits, the Bank may engage local technical and E&S consultants to supervise implementation activities (design, construction, and E&S management) during the early stages of project implementation.

33. **Procurement.** Procurement will be conducted in accordance with the provisions of AIIB's Procurement Policy, January 2016, and Section II of Interim Operational Directives: Procurement Instructions for Recipients (PIR), June 2016. All civil works (except for the Manesar section (km49.7-km55.6), which will be build-only contracts), track work, electrification, and signaling and telecommunication works are proposed to be procured through engineering, procurement and construction (EPC) contracts. The GC will support HRIDC in developing the appropriate procurement packages and procurement and contract management.

34. **Financial Management.** The overall financial management and disbursement work will fall under the responsibility of HORCL. Project financial statement will be prepared on accrual basis in a timely manner and adequately reflect the sources and usage of project funds, which will be submitted to the Bank within 60 days after the end of each semester. The external auditor of the project account will be appointed by the Comptroller and Auditor General (CAG) of India. Such audit report will be submitted to the Bank within 9 months after the end of the fiscal year.

3. Project Assessment

A. Technical

35. **Project Assessment during the COVID-19 Pandemic.** The project team visited the proposed HORC alignment during an identification mission conducted in April 2019. Since travel to India has been restricted in 2020 and 2021, the project team has used video conferencing with HRIDC to continue project assessment and preparation with 29 written meeting minutes for record purposes. The project team has also engaged four local consultants (environmental, social, technical, and gender) to monitor project preparation. The bank team conducted a virtual Appraisal Mission and a site visit during the period of March 21-25, 2022. The latest site visit was conducted on May 23-24, 2022, by local consultants to strengthen the vulnerability and gender inclusion aspects of the project.

36. **Project Design.** The project is proposed to be a new 29.5 km electrified broad-gauge dual-track railway line from chainage km 32 (Dhulawat) to km 61.5 (New Patli).

The project also includes 5 new railway stations and 15.6 km route connectivity lines to IR and DFC at Manesar to Patli/IR (5.12 km), New Patli to Patli/IR (3.07 km), New Patli to Sultanpur/IR (3.21 km) and Dhulawat to New Tauru (near Mewat, 4.21 km). The project is part of the proposed HORC from New Prithla to New Harsana Kalan comprising 125.98 km with 17 new railway stations and 21.89 km of connectivity lines to the IR and DFC at six points, totaling 147.87 km, with a design speed of 160 km per hour for passengers and 100 km per hour for freight.

37. Except for the Manesar (km 49.7-km55.6) section, which will be build-only contracts and the design will be prepared by HRIDC through a consulting firm, the balance section of the project will use EPC contract, wherein contractors will prepare the detailed design. Research Design and Standards Organization's (RDSO)¹⁶ related specifications and typical drawings will apply to the project design. Technical parameters can be found in Annex 2.

38. **Major bridges.** The project includes 15 major bridges with a span of over 12.2 meters. All critical and complicated structures of the entire HORC on the critical path of the work program have already been identified, including a 3.54 km-long viaduct, a 4.69 km long tunnel and 78 major bridges under Part B.

39. **Multi-modal integration.** The project is integrated with the IR and DFC networks as well as with other modes of transport. It will connect to three interchange points at Sultanpur/Farukhnagar IR line, Patli IR line, and DFC line at New Tauru (near Mewat). Further, the project runs parallel to the Kundli-Manesar-Palwal (KMP) expressway, an operational high-speed 6-lane, 135.6 km-long ring road around Delhi in the state of Haryana. The road transport connections between HORC and KMP expressway are being planned and will be done in consultation with the concerned State Government authorities. The project may also integrate with other planned developments. For example, the National Capital Region Transport Corporation (NCRTC) has proposed a Regional Rapid Transit System (RRTS) station at Panchgaon, and this proposed development is very close to the project alignment (approximately 300 meters).

40. Other current and future developments along the project corridor will also help boost the economy in the state of Haryana, as well as provide direct and indirect traffic demand for HORC. For example, the project will provide connectivity to existing logistic hubs in the region, including IMT Manesar (warehouses & automobiles), and Reliance MET. Also, an industrial model township is being developed on 1,545 acres in Sohna of Gurugram.¹⁷ The KMP expressway is also near the industrial model township at Manesar which houses leading companies from various sectors such as e-commerce, automotive, logistics, retail and fast-moving consumer goods. In terms of future development, the Government of Haryana is planning the "Panchgram Scheme" wherein 5 industrial townships (covering 50,000 hectares) are proposed to be developed along each side of the KMP expressway. Suitable road connectivity of HORC stations

¹⁶ RDSO is a research and development organization under the MoR of the Government of India, which functions as a technical adviser and consultant to MoR with respect to the design and standardization of railway equipment and problems related to railway construction, operations, and maintenance.

¹⁷ This land has been acquired by HSIDC. Out of 1,545 acres, 500 acres is reserved for electronic manufacturing companies and the rest of the land is for mixed use i.e., residential, commercial and automobile industries.

with the existing road network connecting logistics hubs and industrial areas is being planned and will be executed by the local State Government authorities.

41. **Gender-friendly, safe, convenient and accessible station design.** There are 5 station buildings for this project (out of 17 stations for the HORC program) and the average gap between stations is about 8 km. The stations are expected to include vulnerability-friendly and socially inclusive features to provide universal accessibility for female, children, elderly, and PWDs passengers following the Indian Railways (IR) guideline of Minimum Essential Amenities (MEA)¹⁸ in stations. The concessionaire agreement between HORCL and MoR also highlights accessibility features. The agreement notes that HORCL has to procure “a barrier-free environment for the physically and visually challenged and for elderly persons using the Rail System” to conform with Ministry of Social Justice and Empowerment guidelines. In addition to the IR guideline, the project will ensure that changing rooms will be constructed at selected stations catering to female employees.¹⁹ Likewise, nappy changing facilities catering to passengers with children will be installed at the station toilets. Women helpline number will also be displayed in at least 3 places in the stations to address any GBV/SEA related concerns. To ensure last mile connectivity for passengers, the HORC stations will also have suitable road connectivity with the existing road networks including with other modes of transportation such as buses, taxis and autorickshaw from the HORC stations. This is being planned and will be executed by the local State Government authorities.

42. **Public utility relocation arrangement.** To mitigate against project delay risks, HRIDC has proactively collected data of existing utilities along the alignment from various utility agencies and departments. HRIDC has identified the need to shift an overhead electrical power line crossing LT/HT of up to 33 KV using underground cables. The removal of other overhead electrical utilities that exist in the proposed HORC alignment has also started. The status of removal progress can be found in Annex 2.

43. **Phased Operation Approach.** The project will be divided into three distinct sections (see Figure 2). Each section will be commissioned with different commissioning targets to facilitate connections to IR network and DFC. These interchanges will facilitate the smooth flow of goods traffic between IR, DFC and HORC and are expected to provide more operational flexibility. The commissioning target for HORC Part A is May 2024 and for HORC Part B is December 2025.

44. **Progress Status of Part B Investment Project.** With support of the GC, the preparation of Part B project is at full speed. The technical survey and design of critical structures (tunnels and bridges) are at the final stage, and the procurement activities of Part B are expected to be launched shortly. The detailed survey and consultation for the land required for the HORC program have been completed. So far, 20% of the land compensation for the program has been transferred. It is expected that 50% of land

¹⁸ The Indian Railway Guideline 2018 include, for examples: separate compartments in train for female passengers; installation of CCTV cameras at stations (full coverage end to end on both platform); operational railway helpline number 139 over the entire network of IR; lift in station buildings; parking lot for two vehicles used by PWDs; hand railings to staircases; provision of signage of appropriate visibilities; PWDs friendly toilet at stations.

¹⁹ Changing rooms are planned for Manesar (Part A) and Kharkhoda (Part B) stations.

acquisition will be completed and 30% of the project cost will be awarded for Part B by the middle of 2023.

45. **Operations and Maintenance (O&M).** The O&M will be governed by a Concession Agreement to be signed between MoR and HORCL (expected by end-2022). Station and train operations will be managed by MoR through its nominated zones and maintenance will be the responsibility of HORCL. MoR will also perform services such as booking and delivery of consignments, rolling stock examinations, maintenance and replacement of rolling stock and payment of power bills for electric traction and platform lighting. HORCL, as concessionaire, will be responsible for periodic maintenance of the rail system, repairs, replacements, and overhaul of the infrastructure (i.e., fixed assets) and maintaining certain key performance indicators.

46. **Paris Alignment (PA).** AIIB has committed to fully align its operations with the goal of the Paris Agreement by July 2023. The Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations provides an approach to assess the mitigation and adaptation alignment of the project. To be considered fully aligned with PA, the project must meet both PA's climate mitigation and adaptation goals. The project is fully aligned with PA for the following reasons:

(i) Climate mitigation: The project, being an electric rail infrastructure, is categorized under the 'universally aligned' list. This means that the project contributes to climate action that is consistent with the mitigation goals of the PA. Hence, no further assessment is needed.

(ii) Climate adaptation: The project has proposed measures to address the identified physical climate risks in its project design, based on the climate and geological risk and vulnerability assessment conducted for the HORC program. The assessment revealed three major risks that can impact the HORC, namely: (i) flooding due to extreme rainfall events especially during monsoon periods, (ii) increase in annual average temperature, and (iii) earthquake risks. Considering these risks, the HORC carefully considered rail design and introduced new technologies to mitigate these risks. Climate change adaptation features include the use of 60 kilogram (T-12) prime quality steel rails; construction of side drains where the railway formation is in cuttings; drop walls and curtain walls in all bridges; rainwater harvesting structures; and adoption of Seismic Zone IV technical standard as applicable to the state of Haryana. Additional civil works costs related to climate adaptation for HORC total INR 40.5 million (about USD 542,000)²⁰. To reduce the extensive use of grid-generated electricity supplied to the stations for their operations and maintenance and thus reduce carbon emissions in stations, the project will also install one 10 kilowatts-peak (kWp) solar plant in each station. This can generate about 1,100 kilowatt-hour (kWh) of electricity a month for each solar plant, and approximately 50 percent of the energy to be used by the stations is expected to have a renewable energy source²¹. Annex 4 provides detailed discussion of the project's PA alignment.

²⁰ Note that the additional civil work costs pertain to side drains and rainwater harvesting structures. Other aforementioned climate adaptation features are standard practice in India.

²¹ Additional civil works and solar panel installations will be included in the EPC contracts of the project.

B. Economic and Financial Analysis

47. The HORC program's objective is to improve rail connectivity in the NCR and decongest the rail corridor in Delhi. The project's full benefits can only be achieved when the program (incl. Parts A and B) is completed, as the project (Part A) comprises around one-third of the cost of the program with three points connected to the IR network and Part B comprises around two-third of the cost of the program and with three points connected to the IR network. The economic and financial analyses as presented below, target the program instead of the project.

48. **Freight demand forecast.** Traffic for the entire HORC program is expected to come from 3 sources, namely: (i) traffic diverted from the original IR route to HORC, (ii) traffic diverted from existing road-based modes to HORC and (iii) traffic generated from the expansion of industries and logistics centers. The traffic demand estimates are derived from the DPR based on the analysis of IR's freight operations information system (FOIS) train data, origin-destination surveys on roads and IR traffic moving via various sections and forecast of production capacities of industrial centers. The projected freight traffic for the HORC program is estimated to be 63.8 trains per day or 70.2 million metric tons per annum in 2028. 84.1 percent of freight traffic is expected to come from the rail-to-rail diversion, followed by new industrial traffic (11.6 percent) and road-to-rail diversion (4.4 percent). Traffic for this project (Part A) is expected to come from the industrial centers. At present, 2.58 trains per day, which will travel to the west of Delhi, is anticipated during the first year of operations of Part A.

49. The total tonnage and number of freight trains for the horizon years on the HORC program is presented in the table below.

Table 3: Projected Freight Traffic on HORC

Year	Tonnage in Million Metric Tons Per Annum (MMTPA)	Trains per day
2028	70.2	63.8
2032	81.4	73.3
2037	89.2	81.5
2042	99.2	92.0
2047	112.2	105.6
2052	129.2	123.5

Source: Detailed project report

50. **Passenger demand forecast.** The rail passenger demand along the HORC alignment is calculated by considering per capita trip rates, passenger trips that will travel along the corridor, proportion of rail-based trips and population growth. To express passenger traffic in terms of number of trains, 1,200 passengers for every train is used. Total passenger travelling by rail on the proposed rail corridor for the horizon period are shown in the table below. Passenger trains represent 24 percent of overall number of trains in 2028.

Table 4: Projected Daily Passenger Traffic

Year	Northerly Direction (Palwal to Harsana kalan)	Southerly Direction (Harsana kalan to Palwal)	Total passenger traffic	Trains per day
2028	12,114	12,114	24,227	20.2
2032	12,938	12,938	25,877	21.6
2037	14,048	14,048	28,098	23.4
2042	15,253	15,253	30,508	25.4
2047	16,562	16,562	33,125	27.6
2052	17,983	17,983	35,967	30.0

Source: Detailed project report

51. **Economic analysis.** The economic viability of the entire HORC program was assessed using a Cost-Benefit Analysis by comparing “with-project” and “without project” scenarios. While the capital expenditure covers the cost of acquiring land, preparing earth works, building permanent ways or railway tracks, bridges, stations, staff quarters and offices, signaling and telecommunication at stations and overhead equipment, the O&M costs cover labor cost, costs of fuel, hiring charges of rolling stock, wagon repair charges, vehicle hire charges, etc. The main beneficiaries would be the passengers, business owners and the logistic companies. The benefits will accrue from (a) reduced travel time, (b) reduction in vehicle operating costs, (c) fewer accidents, (d) reduction in GHG emissions and (e) savings in road infrastructure spending. The analysis indicates that the HORC program is economically viable with an EIRR of 14.59 percent, well above the social discount rate of 9.0 percent. The program also yields a net present value (NPV) of INR40.9 billion (USD548 million) at this discount rate. Sensitivity analysis involving potential cost increase and decline in benefits indicates that the HORC remains viable even under increased costs and reduced benefits. Further details of the economic analysis are presented in Annex 3.

52. **Financial analysis.** The financial analysis can be conducted from the point of view of the program and/or for a specific entity. When conducting an analysis for the entire program, all program revenues (i.e., passenger and freight revenues) as well as capital and O&M expenses are accounted for in the analysis. When conducting financial analysis at the entity level, this accounts for context-specific arrangements between the entity and its partners (e.g., MoR) and not all costs or revenues may be accrued to the entity. This financial analysis focuses on the entity level and for the HORC program.

53. In this case, HORCL is the entity as it is the signatory of the concession contract with MOR. Based on this concession contract, IR shall own the passenger revenues and 50 percent of the revenues from freight operations, in exchange for providing a defined set of operation and maintenance services as per the Ministry of Railways framework of “Model Agreement for Construction, Operation and Maintenance of the Rail System through Joint Venture”.²² These revenue and cost assignments are reflected in the financial analysis.

54. The financial analysis uses the discounted cash flow method over the economic lifetime of the HORC program. The study period was 50 years (i.e., 4 years of phased

²² For more information, refer to:

https://indianrailways.gov.in/railwayboard/uploads/directorate/infra/downloads/Draft_Model_JV.pdf

out implementation and 46 years of full-length operations). Financial Internal Rate of Return (FIRR), in post-tax terms, and Weighted Average Cost of Capital (WACC) were the indicators handled for viability and profitability assessments. Phased implementation was factored into the analysis by assigning proportionate operating revenues and costs during the ramp-up period until the first full operational year for the entire alignment. Connectivity links were also considered alongside the main alignment and effective line length for each of the years were used in calculating the proportional lengths for each period. Capital costs were based on the DPR (dated January 2020), and further revisions carried out by HRIDC to reflect updated numbers as well as to include certain soft costs that were not considered to an adequate extent in the DPR. Total program costs include land, tracks, power lines, S&T, civil works and interest during construction. Freight revenues were calculated using haulage rates as per Indian Railway rates. Non farebox revenues were conservatively assumed at 5 percent of freight revenues. Estimation of operating expenses (in which HORC would be required to provide for only the regular maintenance and upkeep of their fixed assets) was worked out using Kutch Railway Company Limited (KRCL) as the closest comparable for HORC's scheme of operations.

55. Based on the assumptions mentioned above, the post-tax, real FIRR is found to be 8.54 percent as against a real WACC of 2.54 percent. Debt Service Coverage Ratio (DSCR) is acceptable at a minimum of 2.05 times and an average of 3.45 times over AIIB's loan repayment period. Entity-level enterprise NPV, also measured in post-tax and real basis, using the cost of equity (yield on 10-year GoI security with a markup for risk premium in real and post-tax terms) as the discounting factor, worked out to INR 62.76 billion. This discount rate can be treated as equivalent to the opportunity cost for the shareholders, i.e., the cost if they had invested their capital into any other competing public project. The program was found to be viable in base case and also to have the ability to withstand the adverse impact of a few sensitivity parameters. Stress test under some scenarios indicate that the value measures may get impacted, however, minimum DSCR worked out to above 1.0 times under these scenario tests. Further details of the financial analysis are presented in Annex 3.

C. Fiduciary and Governance

56. **Procurement.** HRIDC has a team of technical experts with experience in procurement and contract management. A GC has been supporting HRIDC in project procurement, contract supervision and management, to ensure that the Bank's procurement requirements and standards are met.

57. HRIDC with support from the GC prepared a Project Delivery Strategy (PDS) and Procurement Plan (PP), which includes market approaches, procurement arrangement such as tendering methods, and type of contracts which the project team has reviewed and accepted as meeting the Bank's requirements. Since HRIDC has limited MDB experience, the procurement risk is assessed as medium. Barring two small value contracts, all contracts will be subject to Bank's prior review.

58. **Financial Management.** The HRIDC will be responsible for the project financial management and disbursement activities. The AIIB loan will be provided by India's Ministry of Finance to HORCL through GoH in the way of Pass-Through Assistance, and

the debt will be finally borne by HORCL and reflected in its financial statements. GoH will provide necessary funds to HORCL through Public Works Department and HRIDC on a regular basis based on project budget and implementation progress. HORCL will make payment to contractors/consultants against documents verified by HRIDC. As the project owner, HORCL will receive invoices issued by service providers, prepare vouchers, keep project accounting and financial reporting, which will be subjected to annual project audit conducted by auditors nominated by CAG. The audit reports and audited financial statements will be submitted to AIIB no later than 9 months after the end of each fiscal year.

59. A full-fledged project financial team is on board and a computerized accounting system is being adopted for project accounting and reporting. A chartered accountancy firm will be engaged to conduct internal audit on a quarterly basis to enhance project internal control and ensure proper usage of project funds.

60. Key financial management risks identified are (i) Both HRIDC and HORCL have limited project management experience with IFIs on IFI fiduciary requirements; (ii) Lack of efficient coordination between HRIDC and HORCL may cause implementation issue in timely payment and proper accounting. Mitigation measures that will be adopted are (i) HRIDC has engaged an accounting and management consultancy firm (PricewaterhouseCoopers) to assist them in project preparation, and a project implementation entity with financial function has been established; (ii) Additionally, an experienced individual consultant has been engaged to strengthen the financial management capacity; (iii) Fiduciary responsibilities and other necessary internal control procedures have been defined to ensure loan proceeds are properly used with due efficiency and effectiveness; and (iv) Construction Agreement was signed to clarify the roles and responsibilities of HRIDC and HORCL, and funds flow arrangements via various agencies have also been agreed and documented.

61. **Disbursements.** Four disbursement methods, Direct Payment, Reimbursement, Advance Commitments, and Special Commitments will be available to the project. Following Department of Economic Affairs' (DEA) instruction, reimbursement will be primarily used by HORCL through Controller of Aid Accounts and Audit (CAAA). Loan proceeds will be reimbursed to the Ministry of Finance, GoI, then State government of Haryana, Public Works Department, HRIDC and finally to HORCL. The detailed disbursement requirements will be set out in the Disbursement Letter.

62. **Governance and Anti-corruption.** AIIB is committed to preventing fraud and corruption in the projects it finances. It places the highest priority on ensuring that projects it finances are implemented in strict compliance with AIIB's Policy on Prohibited Practices (2016). Implementation will be monitored regularly by AIIB staff. The Bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive or obstructive practices, and misuse of resources and theft or coercive practices relating to the project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. Detailed requirements and reference to the Bank's Policy on Prohibited Practices will be specified in the Loan Agreement and the project tender documents. AIIB will monitor the work related to tender preparation and evaluation under Bank financing.

D. Environmental and Social

63. Environmental and Social Policy (including Standards) and Categorization:

AIIB's Environmental and Social Policy (ESP), including the Environmental and Social Standards (ESSs) and the Environmental and Social Exclusion List, applies to this project. E&S due diligence (ESDD) determined that ESS 1 (E&S assessment and management) applies to the assessment of E&S impacts of project activities. ESS 2 (involuntary resettlement) also applies, as project related activities will require significant land acquisition which in turn will cause physical and economic displacement. The Social Impact Assessment (SIA) carried out as part of the ESDD indicates that there are no Scheduled Tribes in the project districts and within the administrative boundary of the State of Haryana. Therefore, ESS3 (Indigenous Peoples) is not applicable. The project has been classified as category A, in accordance with the Environmental and Social Policy (ESP), because of the social risks and impacts stemming from the displacement of a significant number of project-affected people. The ESIA and RP have been conducted for the HORC program.

64. **Environmental Aspects.** Majority of the HORC program alignment will align with the existing KMP Expressway corridor. Noise impacts to receptors along the alignments are anticipated during both construction and operation stages. A noise and vibration study including more detailed baseline monitoring and noise modeling has been carried out by HRIDC. There are no sensitive receptors to be affected. Other negative impacts of the project during the construction phase are temporary and reversible. These include solid waste disposal, increased water use, air pollution, impacts on borrow areas, occupational and community health and safety, and disturbance to communities and public utilities. The Environmental and Social Management Plan (ESMP) delineates the mitigation measures for the identified risks and impacts. The ESMP includes the reporting mechanisms for the responsible agencies and the monitoring plans during the construction and postconstruction phases. The estimated budget for implementing the ESMP is also included. All suppliers and contractors shall be informed of employment practices being consistent with health safety and environmental provisions of the ESMP. Compliance to the ESMP is an essential part of the contract document with suppliers and contractors. This document shall be a part of purchase order of each service contractor. Representations and warranties to be provided to HRIDC by suppliers and contractors will be incorporated into agreements and contracts. The Safety, Health and Environment (SHE) manual, and management plans for labor camps, construction sites, traffic and solid waste, are included in the ESMPs. These management plans will provide guidance for site-specific ESMPs to be prepared by the contractors. The comprehensive ESMPs are being incorporated, along with other Environmental, Social, Health and Safety requirements, into the tender documents. HORC will ensure the integration of Environmental, Social, Health and Safety requirements in all tender documents and supervise the preparation and implementation of site-specific ESMPs by contractors.

65. **Climate Change and Geological Risks.** The HORC program will contribute to climate change mitigation by (i) encouraging commuters to shift from road-based transport to rail based electric-tracked public transport and (ii) reducing congestion on the existing IR network, thereby allowing IR to be able to run more passenger trains on existing routes. Net GHG emissions reductions is estimated at 61,100 tCO₂ on average

per annum when the HORC program is constructed. Greenhouse gas reduction calculation over time is elaborated on Annex 4.

66. The major climate change risks identified in the Haryana area include an increase in average annual temperature and flooding due to extreme rainfall events. There are also earthquake risks since all districts in Haryana state lie in Zone IV and high damage earthquake risk zone. The HORC will integrate climate change and geological risk considerations into the project design to address the need for adaptation, including: (i) use of 60 kilogram (T-12) prime quality steel rails to adapt to extreme temperature increase ; (ii) designing for better adaptability to high rainfall events leading to heavy flooding through the use of side drains in the segments where the railway formation is in cuttings and running through village areas ; (iii) through better station roof design, providing for rainwater harvesting by channeling rainwater through gutters and pipes to either harvesting pits in the ground or to recharge groundwater; (iv) drop walls and curtain walls on bridges to adapt to flooding risks; and (v) adopting Seismic Zone IV earthquake resistant design standards. The project will also use solar panels on station buildings and roofs to reduce the extensive use of grid-generated electricity supplied to the station for its operation and maintenance.

67. **Social Aspects:** The HORC alignment passes through five districts (Palwal, Nuh, Gururgram, Jhajjar and Sonipat) and eighty-eight villages of the state of Haryana and is broadly situated on a greenfield alignment. A total of 736.65 hectares of land will be required to carry out project activities for the HORC program, out of which public and private land account for 210.18 and 526.47 hectares respectively. The land requirement for Part A is 212.24 hectares, of which 89.313 hectares are public land and 122.926 hectares are private land. The potential adverse impacts of land acquisition include loss of land, loss of structures (residential, and commercial) and loss of trees and crops and community and religious properties. Specifically, the HORC program will negatively impact 9,889 Project Affected Households (PAHs), out of which 9,885 are titleholders and 4 are non-titleholders. Moreover, 371 private structures will be affected by the program (Residential structure:19; Commercial structure: 14; and other structure: 338). The program will also impact 18 Community Property Resources and 6,449 trees. For Part A, the project will affect 3,467 PAHs, out of which 3,464 are titleholders and 3 are non-titleholders.

68. Land acquisition for the HORC program is likely to have disproportionate impacts on 491 vulnerable households²³ and lead to loss of jobs and business income. The nature of the civil works is anticipated to induce short-term impacts linked to temporary loss of access, risk of child labor, labor influx, disruptions to commercial activities and adverse effects on public utilities. To mitigate the project's negative impacts, HRIDC finalized and disclosed an environmental and social impact assessment (ESIA) and a Resettlement Plan (RP). The RP includes a detailed Entitlement Matrix that identifies the entitled unit, category of loss and links them with compensation and assistance measures. Along with including compensation at replacement cost for impacted assets for both titleholders and non-titleholders, the entitlement matrix includes among other measures, transition allowance, lump sum payment for vulnerable groups, subsistence

²³ Vulnerable households/groups are categorized as follows: families below the poverty line, scheduled castes, scheduled tribes, female headed households, elderly people, and people with disabilities.

allowance, assistance for vendors, rental allowance and cash compensation for loss of income for business owners and workers. Moreover, along with providing short term mitigation measure, the RP includes long term rehabilitation measures in the form of a livelihood restoration plan. The focus of the Livelihood Restoration Plan (LRP) is to carry out a detailed skill mapping and supporting PAPs in getting access to various training institute and government schemes. The aim of the compensation and livelihood restoration measures are to improve or at least restore the livelihoods of all displaced people to at least pre-displacement levels. Meaningful stakeholder engagement has been carried out during the ESIA and RP development process, and the outputs obtained from these consultation meetings helped in formulating strategies for minimizing impacts caused by the project.

69. There are no Scheduled Tribes within the administrative boundary of the State of Haryana and the SIA did not identify any Scheduled Tribes in the project areas. Therefore, ESS 3: Indigenous Peoples will not be applicable for the project.

70. **Gender Equity and Social Inclusion:** The project has intertwined gender equality and social inclusion dimensions throughout the entire project life cycle, including project preparation, design, construction, and operations. A Gender Action Plan (GAP) was also prepared for the HORC program in consultation with the government counterpart and advised by AIIB's gender consultant. Gender and inclusion dimensions of the project are further elaborated in Annex 5.

71. During project preparation, the project has carried out culturally appropriate and meaningful consultations with women and vulnerable groups as part of the preparation of the SIA and RP. The project conducted 20 consultations in five districts with women and vulnerable groups. The socio-economic survey conducted by the project included 40 percent female respondents whilst including 50 percent female investigators as part of the research team. The consultation sessions aimed to capture and reflect the concerns and aspirations of women and vulnerable group to inform the design of the project and to enhance mitigation measures. The project plans to continuously engage and consult with the various categories of stakeholders over the course of the project implementation period.

72. Gender inclusive technical design and guide implementation has been included in the RP to amplify the project gains in terms of strengthening women's empowerment and safety as well as mitigating any adverse impacts of the project on women and other vulnerable groups. Specifically, the GAP outlines activities that support gender and inclusion mainstreaming in the project. Some of the key focus areas include augmenting accessibility, inclusiveness and safety in the design of stations.

73. As part of the construction stage of the HORC, HRIDC will develop and implement a GBV/SEA code of conduct. Moreover, an Internal Complaints Committee (ICC) will be set up to address grievances related to SEA at the workplace. In order to promote gender sensitization, capacity building trainings and orientations will be organized for contractors, construction workers and local communities covering issues related to GBV/SEA, sexually transmitted infections including HIV, and human trafficking. Safety and security of women construction workers will also be ensured through establishing separate accommodation, toilets, CCTV surveillance and adequate lighting.

Upon completion of the entire HOCR program, a survey will be conducted during the first year of the operations stage to gauge the satisfaction level of vulnerable groups, including women passengers, on station facilities and services. This will guide the HOCR in terms of enhancing its services for women passengers.

74. In order to strengthen the institutional capacity of HRIDC throughout the project life cycle, environmental and social training sessions on ESMP, including on gender issues, will be delivered by AIIB staff for HRIDC, GC and contractors. Also, at least one gender specialist within the GC team and a gender focal point in HRIDC will be hired for effective GAP implementation. The project will also focus on collating, analyzing and monitoring sex and age disaggregated data and improving workforce diversity and gender balance within the HRIDC.

75. **Occupational Health and Safety, Labor and Employment Conditions.** The EPC contractors are required to follow SHE guidelines for railway projects in India. SHE Manual which also cover worker safety will be included as part of the contractual obligations of the selected civil works contractors (EPC) and subcontractors. Proper design and precautionary measures will be included to ensure reduced disease spreading risks, such as COVID 19. Labor camps will include the standard Health and Safety measures. Relations with the community will be managed and controlled by the EPC contractors through a Code of Conduct. The project will conform with the labor laws and standards of the Republic of India. Due diligence will also look at the performance of the project in terms of how they conform with the country's labor laws and regulations during construction and operations phase, and prepare a labor management plan, if needed.

76. **Stakeholder Engagement, Consultation and Information Disclosure.** A Stakeholder Engagement Plan (SEP) has been prepared for the HOCR program, as encapsulated in the ESIA. Meaningful consultations with various categories of stakeholders have been carried out to ensure that project-affected people are aware of the project details and safeguard measures to be implemented. The design and mitigation measures related to the project incorporate pertinent issues raised by communities during the consultation sessions. HRIDC has disclosed the ESIA and RP on its websites. HRIDC also plans to carry out additional consultation prior to and during implementation to ensure that the land acquisition, resettlement, and rehabilitation process are carried out in a participatory manner reflecting the aspirations and comments of the Project affected people. The ESIA and RP report (in English) along with its Executive Summary (in both English & Hindi) have been posted on HRIDC's and AIIB's websites before the Appraisal stage as part of information disclosure process. Hard copies of the report will be kept in HRIDC Offices and site offices, concerned District Collector's Office for public information and disclosure.

77. **Project Grievance Redress Mechanism and the AIIB Project-affected People's Mechanism.** A project-level Grievance Redress Mechanism (GRM) has been proposed for the project. There will be the Grievance Redress Committees to hear and redress the grievances, if any, of the project affected families (PAFs) and Persons (PAPs) at local (project) level (Tier 1) as well as in the HOCR in Gurugram (Tier 2). Tier 1 of the Grievance Redress Committees at field level will consist of field staffs of HRIDC, GC, Contractor and Representative of Project Affected Persons. Proposed project-level

GRM will be established to receive, acknowledge, evaluate and facilitate the resolution to the complaints relating to the issues of E&S and project contracted workers with corrective actions proposed. This will be undertaken using understandable and transparent processes that are gender responsive, culturally appropriate, and readily accessible to all segments of the affected people. Records of grievances received, corrective actions taken, and their outcomes shall be properly maintained. Information of established project specific GRM as well as the PPM of AIIB at least in local language will be timely disseminated to the local communities in an appropriate manner.

78. **Applicable Independent Accountability Mechanism.** The Project-Affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level Grievance Redress Mechanism (GRM) or the processes of AIIB's Management. For information on AIIB's PPM, please visit: <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

79. **Monitoring and Supervision Arrangements.** The project's E&S issues, including ESMP implementation, will be monitored by HRIDC with support of qualified experts from GC. The GC will prepare semi-annual ES monitoring reports and submit to AIIB through HRIDC. Also, AIIB will supervise the project's E&S aspects remotely with support from local ES consultants while travel is restricted due to the pandemic. AIIB will conduct onsite supervision missions once travel restrictions are lifted. At least a summary of ES monitoring report in local language will be prepared and disclosed in an appropriate manner annually.

E. Risks and Mitigation Measures

80. Based on the current assessment, discussions with HRIDC, and review of available documents, the Bank has assigned an overall "Medium" risk rating to the project.

Table 5: Summary of Risks and Mitigating Measures

Risk Description	Assessment Ratings (High, Medium, Low)	Mitigation Measures
<p>Implementation risk for Part B of the HORC program. Part B of HORC may not happen.</p>	<p>Low</p>	<p>The HORC program is part of the National Infrastructure Pipeline, a master list of infrastructure projects drawn by Ministry of Finance and Department of Economic Affairs (DEA). This pipeline aims to build investor assurance by actively monitoring key projects and resolving any potential issues through regular and close monitoring.</p>

Risk Description	Assessment Ratings (High, Medium, Low)	Mitigation Measures
		<p>GoH has a strong commitment to the program. The HRIDC board of directors is chaired by the Chief Secretary of the GoH and holds a minimum of six meetings a year to review the HOCR's progress. Once the project starts construction, the board meeting will be held quarterly to check the project's physical and financial progress regularly.</p> <p>The ESIA for the HOCR program was already disclosed in March 2022. The project development strategy with procurement plan of the HOCR is prepared and cleared by the Bank team, and the procurement activities is being carried out as per the plan. In terms of land acquisition for Part B of the HOCR program, this is expected to be completed by the middle of next year.</p> <p>In addition, the project finances consultancy services, including the general consultant, for the overall HOCR program management and the preparation of Part B investment.</p>
<p>Institutional Capacity for Implementation and Sustainability. The project is the implementing entity's first time dealing with an MDB, which may cause potential delays during procurement and implementation. These delays may result to time and cost overruns.</p>	Medium	<p>A GC with the ToR cleared by the Bank team has been on board in April 2021, supporting HRIDC in the overall program preparation and management, including procurement, contract supervision and management, to ensure that the Bank's procurement requirements and standards are met.</p> <p>High value, high risk tenders will be subject to Bank's prior review.</p>
<p>Project implementation delay. Delays may occur because of the</p>	Low	<p>COVID-19 has eased in many parts of the world, including in India. Splitting the HOCR program into Parts A and B</p>

Risk Description	Assessment Ratings (High, Medium, Low)	Mitigation Measures
ongoing COVID-19 pandemic, which might hinder the mobilization of labor and materials.		enables Part A to move forward and facilitate a phased operation approach.
<p>Environmental, Social and Gender. Implementation of E&S Plans, including E&S staff for monitoring and implementation, may be inadequate.</p>	Medium	The project implementation entity has designated its staff to oversee the implementation of E&S plans. In addition, the GC has full time Environmental and Social specialists in its roster. A Gender Specialist at GC will also support the implementation of GAP. These specialists will be responsible for the day-to-day implementation, monitoring and reporting of E&S and gender action plans. Moreover, a Gender Focal Point at HRIDC will be appointed to oversight on effective implementation of GAP.
<p>Financial Management. The joint implementation model may cause inefficiency and ineffectiveness.</p>	Low	Mutual agreements have been reached and documented to define responsibilities and coordination mechanisms.

Annex 1: Results Monitoring Framework

Project Objective:	To contribute to improving rail connectivity in the NCR and partially decongesting the rail corridor in Delhi.							
Indicator Name	Unit	Baseline Data Year (2022)	Cumulative Target Values			End Target	Frequency	Responsibility
			2023	2024	2025	2026		
1. Kilometers Constructed	Km	0	11.8	17.7	29.5	29.5	Annually	HRIDC
2. Construction of Major Bridges	Number	0	4	10	14	14	Annually	HRIDC
3. Construction of stations	Number	0	2	4	5	5	Annually	HRIDC
4. Track installation	Km	0	11.8	17.7	29.5	29.5	Annually	HRIDC
5. S&T installation	Km	0	11.8	17.7	29.5	29.5	Annually	HRIDC
6. OHE installation	Km	0	11.8	17.7	29.5	29.5	Annually	HRIDC
7. Construction of rainwater harvesting facilities at each station	Yes/No	No	Yes	Yes	Yes	Yes	Annually	HRIDC
8. Installation of solar roof panels at each station	Yes/No	No	Yes	Yes	Yes	Yes	Annually	HRIDC
9. Gender-friendly and accessible designs in stations	Number of stations	0	2	4	5	5	Annually	HRIDC
10. GBV/SEA orientations conducted for civil works employees as per the GAP*	Number	2	5	8	10	10	Annually	HRIDC

* Orientations will be conducted twice per contract package, once prior to commencement of construction and another during the middle of implementation. There are 5 contract packages for Part A.

Annex 2: Detailed Project Description

A. Haryana Orbital Rail Corridor

- 1. Background on the NCR.** The NCR was created under the NCR Planning Board Act of 1985. This region covers the National Capital Territory (NCT) of Delhi and several districts surrounding the states of Haryana (7 districts), Rajasthan (1) and Uttar Pradesh (5). In terms of land area (total area of 33,578 km²), NCT of Delhi is a small part of the region at less than 5%, while regions of Haryana comprise roughly 40%, Rajasthan (23.3%) and Uttar Pradesh (32.3%). Population wise (over 64 million¹), Delhi comprises 36.4%, followed by Uttar Pradesh (31.6%), Haryana (23.9%) and Rajasthan (8%). Today, it accounts for about 8% of the country's gross domestic product (GDP), contributed primarily by New Delhi (followed by Haryana), and over 20% of the country's foreign direct investments (FDI).
- 2.** NCR is the most important economic hub in North India that connects with several economic and manufacturing centers in the neighboring states. It is home to many special economic zones and industrial clusters, such as Noida and Gurugram (IT services sectors), Faridabad (industrial center) and Meerut (education hub). It is also an automotive manufacturing hub (Gurugram, Alwar). Nonetheless, the NCR also includes agriculture, mainly located in Rajasthan and Uttar Pradesh.
- 3.** NCR is the fastest-growing urban agglomeration in India with an urbanization rate of 62.5% (twice the national average), and projections show that the rate would further increase to 71 percent in a decade². Delhi, in particular, has an urbanization rate of 97.5%. Therefore, reducing congestion in the NCT of Delhi is vital for harmonized and sustainable development across the NCR³. Developed over the past 100 years, the NCR rail network converge at Delhi and consists of complex rail radials and hubs with passenger and freight traffic being distributed in and out of the eight radials covering three Zonal Railways (Northern, Northwestern, and North Central) and five divisions. A large volume of traffic moves within and across the radial railway networks: For the 15 Delhi sections, as seen in Table A2.1, over 2,000 trains run daily each way. The split between traffic is as follows: passenger (65%) and freight (35%). The existing rail network in the NCR is shown in Figure A2.1.

¹ The 2021 census has not yet been released but projections indicate that 2021 population would have reached 64 million.

² Government of India, Ministry of Housing and Urban Affairs, National Capital Region Planning Board. 2013. Regional Plan 2021: National Capital Region. New Delhi.

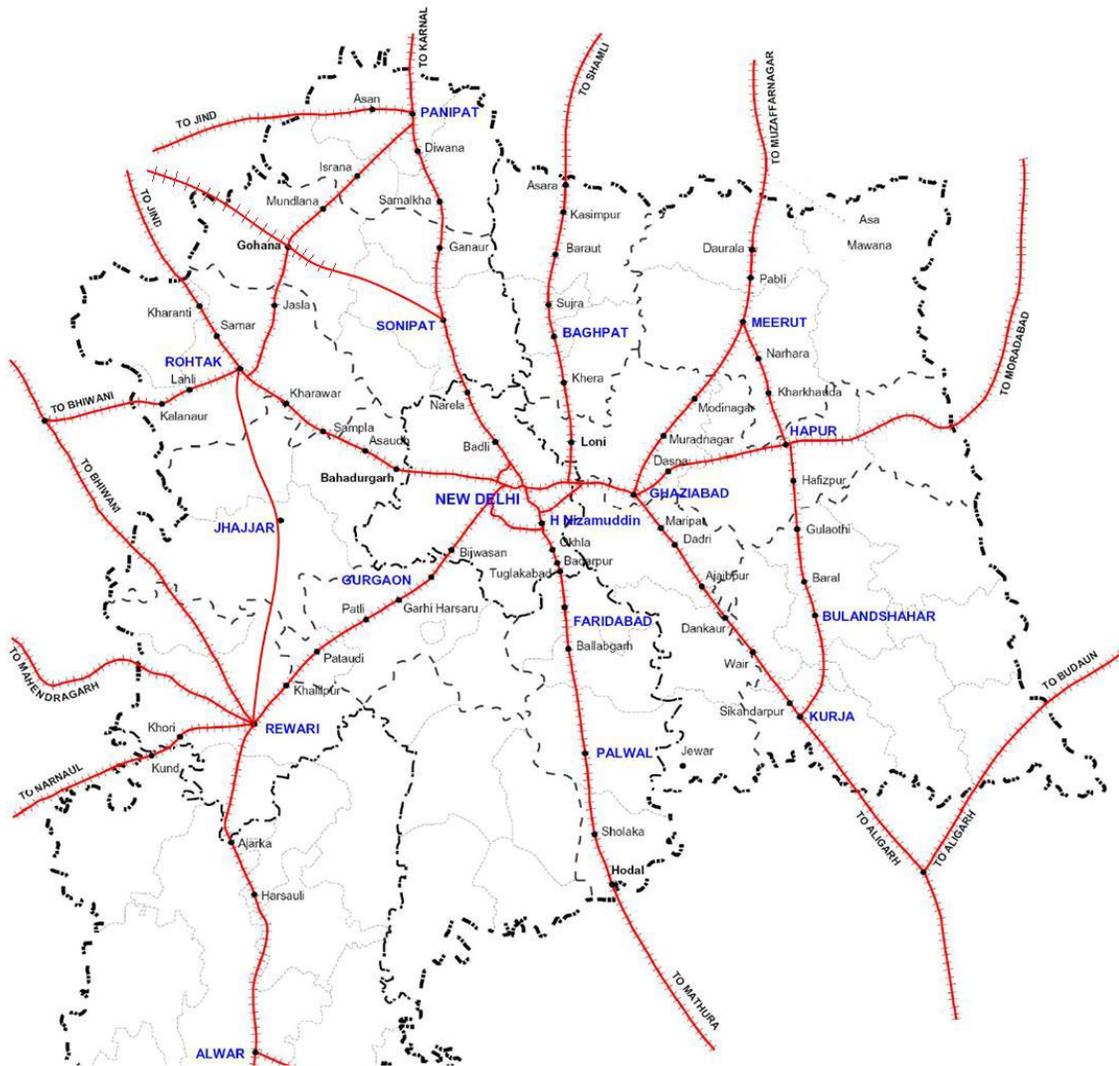
³ NCRTC-NIUA. 2019. Detailed report on Value Capture Financing: Implementation of Transit Oriented Development along Delhi-Ghaziabad-Meerut RRTS Corridor. Delhi.

Table A2.1: Line utilization of various Delhi sections

Section	Distance (km)	Daily trains running each way		
		Passenger	Freight	Total
1 Delhi-Ghaziabad (DLI-GZB)	19.88	309	105	414
2 Ghaziabad-Meerut City (GZB-MTC)	47.29	23	12	35
3 Delhi-New Delhi Railway Station (NDLS)-Palwal	239.14	579	290	869
4 Hazrat Nizamuddin Railway Station- Lajpat Nagar (HNZM-LPNR)	1.88	8	18	26
5 Okhla-Lajpat Nagar (Daliganj) (OKA-LPNR(DAL))	2.45	5	22	27
6 Okhla-Tughlakad (OKA-TKD (GAL))	6.85	3	44	47
7 Lajpat Nagar- Delhi Safdarjng-PTNR (LPNR-DSJ-PTNR)	17.57	13	43	56
8 Delhi-Rewari (DLI-RE)	88.64	116	53	169
9 Garhi Harsuru-Faridabad (GHH-FN)	11.2	6	0	6
10 Asthal Bohar-Rewari (ABO-RE)	75.27	4	1	5
11 Delhi-Panipat (DLI-PNP)	88.29	136	54	190
12 Delhi-Rohtak (DLI-ROK)	142.09	133	57	190
13 Rohtak-Jhir (ROK-JHI)	57.15	19	16	35
14 Jhir-Gohana-Sonipat (JHI-GHNA-SNP)	89.1	2	1	3
15 Sahibabad-Anand Vihar Terminal (SBB-ANVT)	5.68	29	2	31
Total	892.48	1385	718	2103

Source: DPR, January 2020.

Figure A2.1: Existing Rail Network in NCR



Source: HRIDC

4. Currently, the rail network in the NCR operates as a transit point for passenger and freight volumes moving between Punjab, Haryana, Rajasthan on the one side and the rest of the country on the other. Through freight traffic also needs to pass through the NCR area, in particular Delhi, thereby utilizing capacity on saturated lines that could be used for local or locally destined traffic. In fact, almost all railway lines carrying through-traffic (not-destined) within Delhi are close to or above their saturation levels as listed below.

Table A2.2: Rail Traffic in Delhi with Saturation Levels

No.	Area	Saturation level (%)
1	Lajpat Nagar-Patel Nagar Delhi Avoiding Line (DAL)	133
2	Patel Nagar- Adarsh Nagar	98
3	Adarsh Nagar – Sonipat- Panipat	121
4	Patel Nagar – Delhi Cantt (North Line)	65
5	Tilak Bridge – Anand Vihar	174
6	Nizamudin – Tughlakabad	163
7	Tughlakabad – Palwal	141

Source: DPR

5. Apart from insufficient physical capacity issues, growth in passenger and freight has also adversely affected day-to-day train operations, with the average speed rapidly declining to 17 kmph for freight train due to the frequent addition of new trains.⁴ Other infrastructure bottlenecks also exist in the IR, such as poor passenger services, ageing infrastructure, absence of modern automated signaling across the network.⁵

6. The rail network in the state of Haryana, comprising about 1,700 route kilometers, also suffers a similar fate, with most IR lines operating above 90% of capacity and its rail network needing to pass through Delhi thereby becoming a major source of bottleneck for its industrial growth. This rail network, which connects various important Haryana districts, involves passing through Delhi, particularly for Gurugram, Faridabad, Balabhgarh and Palwal area. Other existing transport modes in Haryana also do not adequately address passenger and freight needs. Road transport for freight is also less environmentally friendly compared to the more energy-efficient rail transport. Moreover, since traffic pattern in Haryana and the NCR region more broadly is of mixed type (passenger and freight), metro rail is not deemed suitable since it only serves passenger traffic.

7. **HORC Program.** The HORC alignment involves the construction of 125.98 km of electrified high-rise OHE dual-track railway line that includes 21.89 km connectivity lines to IR and DFC lines, 17 stations, a 4.69 km long tunnel, 3.54 km viaduct, and 421 bridges. The HORC is envisaged to provide a new freight and passenger railway line that improves regional connectivity and reduces congestion in Delhi NCR. HORC is part of the Republic of India's National Infrastructure Pipeline (NIP).⁶ It has the following objectives:

⁴ Functional Plan on Transport for National Capital Region – 2032

⁵ <https://www.globalrailwayreview.com/article/118701/indian-high-speed-rail-challenges/>

⁶ HORC is listed in NIP against the project ID-705936 and can be accessed through the Ministry of Commerce and Industry's website www.indiainvestmentgrid.gov.in. The National Infrastructure Pipeline is harmonized master list of infrastructure project drawn by Ministry of Finance and Department of Economic Affairs with aims to boost the economy to create more employment opportunity in different sectors, provide better infrastructure for all sectors, enhance ease of living for its citizens and make growth more inclusive. The national infrastructure pipeline hopes to build investor assurance by actively monitoring key projects, bring needed reforms and resolve any potential issues through regular and close monitoring.

- i. To facilitate the diversion of freight traffic not meant for Delhi, thereby promoting the development of multimodal hubs in the NCR region of Haryana.⁷
 - ii. To increase passenger mobility options and enhance economic and social activity of the NCR region of Haryana.
 - iii. To mitigate congestion and pollution in Delhi by providing a peripheral railway system that bypasses the highly congested Delhi.
8. The HORC program alignment is comprised of two Parts:
- i. Part A: Construction of 29.5 km of HORC and 15.6 km route connectivity lines, from chainage km 32 to km 61.5 (the Project).
 - ii. Part B: Construction of 96.48 km of HORC and 6.28 km route connectivity lines, from chainage km 0.0 to km 32 and km 61.5 to km 125.98.
9. The table below shows the phasing of the work between Part A and Part B of the HORC program:

Table A2.3: Phasing of HORC Program

Indicators	Part A (the project) *	Part B	HORC program**
1. Kilometers Constructed	29.5	96.39	125.89
2. Construction of Major Bridges	14	79	93
3. Construction of stations	5	12	17
4. Track installation	29.5	96.39	125.89
5. S&T installation	29.5	96.39	125.89
6. OHE installation	29.5	96.39	125.89

Note: * As per Result Monitoring Framework (Annex 1); ** including Part A and Part B.

10. At completion, the HORC program will achieve the following results:
- i. Average 1.5 hours travel time saved per trip by freight using HORC, compared to original IR Route (from Palwal to Harsana Kalan)
 - ii. 49 freight trains diverted from original IR route to HORC.
 - iii. 20 passenger trains carried.
 - iv. 70 percent of vulnerable (female, elderly, disabled) passengers in User Survey satisfied or very satisfied with station facilities and services
11. Key HORC features are as follows:

⁷ The NCR encompasses Delhi (capital of the country) and surrounding states including Haryana, Uttar Pradesh and Rajasthan.

- Route length: 125.98 km, plus connectivity lines to IR and DFC of 21.89 RKM
- Gauge: Broad Gauge 1,676 mm
- Design Loading: 25T axle load
- Design Speed: 160 km per hour for passenger, 100 km per hour for freight
- Tunnel: One, 4.69 km (Part B)
- Viaduct: One, 3.54 km (Part B)
- Bridges: 421 bridges, of which 93 are major bridges with a span of over 12.2 m. 15 out of 93 major bridges are in Part A.
- Proposed Stations: 17 new double line stations, including 5 for Part A and 12 for Part B. The average inter distance between stations is 8.696 km.
- Rolling Stock: No new rolling stock is required as existing IR rolling stock will be used.
- Signaling system will be based on multiple aspect color light signals with electronic interlocking and digital axle counters for train detection.
- Telecommunications will be based on optical fibers, 25/5 W VHF radio and will have public address systems at stations.
- Traction will be electric at 25kV AC with high rise catenary system and SCADA system for monitoring and control.
- 60kg 90UTS rails will be used for track for the main line and 60/52 Kg secondhand rails to be used on loop lines and as guard rails for major bridges.

12. HORC alignment connects five existing IR lines namely Delhi-Mumbai line, Delhi-Jaipur-Ahmedabad, Garhi Harsuru-Farukhnagar line, Delhi-Rohtak line and Delhi-Ambala line. Part A of the HORC will connect to the Garhi Harsuru-Farukhnagar line and the Delhi-Jaipur-Ahmedabad line (at Patli). HORC alignment starts from Prithla station (at KM 0.00) which will be connected to Delhi-Mumbai IR line through New Prithla station of DFC at KM -2.10 and runs along the KMP Expressway and ends by connecting with Delhi-Ambala IR line near Harsanakalan Railway Station.

13. The HORC program alignment will pass five districts of Haryana State, namely Palwal, Gurugram, Nuh (Mewat), Jhajjar and Sonipat. These districts comprise over 6 million people: According to the 2011 Census of India, Palwal has a population of 1,042,708, Gurugram (1,514,432), Nuh (Mewat) (1,089,263), Jhajjar (958,405) and Sonipat (1,450,001). Part A of the HORC will be in Gurugram and Nuh districts.

14. The HORC supports the National Capital Region Planning Board (NCRPB)'s vision to develop the entire NCR as a 'region of global excellence' through promoting economic growth and balanced development of the region. The Regional Plan 2021 for the NCR seeks to achieve this goal through provision of rail-and-road-based transportation networks as one of the measures. One of these networks include the HORC, which is envisioned to connect the entire major railway corridor radiating from Delhi.

B. Detailed Description of the Project

15. The project (Part A) is estimated to cost USD277.83 million distributed across various works, including consultancy services, civil works, electrification works, signaling and

telecommunication works, and track works. The entire HORC program is estimated to cost USD833.35 million.

16. **General Consultant (GC) and other consultancy services.** The GC will act as the Employer's Engineer and will be primarily responsible for the overall program (including Part A and Part B) management and monitoring, procurement support, contract management, site supervision, quality assurance, testing and commissioning. Besides technical support, the GC will assist in ensuring compliance measures for environment and social matters and reporting at various levels. The GC will augment the capacity of HRIDC to undertake and manage the project and will have sufficient manpower experienced in project management, engineering, quality, project scheduling, environmental studies and operation and maintenance. The GC team is headed by an experienced Project Director and is divided into key and non-key experts.

17. Other consultancy services include detailed design surveys, geological/geo-technical investigations, E&S assessments, and monitoring.

18. **Stations.** 5 stations will be constructed under the project (Part A). The stations will be double line stations with most of the stations having two loop lines with crossovers at suitable locations for better operational flexibility. Some stations, such as Manesar, will have provisions for connectivity to major private sidings. Inter-station distance will vary from 5,063 m to 16,869 m which is optimal for main line railways. Details of the station is given in Table A2.4.

Table A2.4: List of stations

S. No.	HORC Station	Chainage (m)	No. of lines
1	Dhulawat	32770.000	4 + 1 track machine siding
2	Chandla Dungerwas	42607.937	2
3	Pachgaon	46287.334	2
4	Manesar	51889.690	5
5	New Patli	58009.172	5

Source: HRIDC

19. **Power supply.** The power supply for Part A will be taken from high voltage grid substations of Haryana Vidyut Prasaran Nigam Limited (HVPNL) at Chandla Dungerwas. Electrification works are planned to be done in the composite EPC packages possibly through specialized subcontractors. The project includes modifications in existing grid substations to facilitate the power transfer.

20. The system will run on 25 kV single phase 50 Hz AC traction through OHE. The OHE will be high rise to facilitate movement of double stack containers. Since the DFC network is also at double height, it will enable seamless movement of goods traffic between HORC and DFC. Power from the grid substations will be fed into the electric traction system through the traction substation (TSS) at Chandla Dungerwas.

21. The traction system will be supervised and controlled through Supervisory Control and Data Acquisition (SCADA) system. SCADA systems works through a set of Remote Terminal Units spread over the network interfacing with the field equipment and a software package

installed at a central control location. The communication is through a fiber optics network. The SCADA system will be based on RDSO specifications, thus helping in better integration with the existing IR system. Since the SCADA system cannot be divided into different packages, HRIDC proposes to get it done under one of the EPC packages. Other areas will include general electrical works at the stations and other buildings. 11kV /440 v sub-stations are proposed at stations for power supply to station buildings, platform lighting, water pumping stations etc. Power for these substations shall be tapped from local power distribution network. Adequate lighting will be ensured at the stations and all service buildings. The project will also include installation of solar panels on roof tops to maximize the use of green energy.

22. **Signaling and Telecommunication works.** This covers the signaling and telecommunication systems including provision of signals, interlocking arrangement, train detection system, data loggers, power supply for signaling gear, optical fiber network, public address system, radio, telephone exchange and allied works. These works will also be done clubbed under the different composite EPC packages.

23. The signaling system proposed is based on electronic interlocking catering to absolute block working. The train drivers will follow line side signals which will be multiple aspect LED based color light signals. The point machines used for crossovers and turn outs will be electrical and complying with the RDSO specifications. There will be data loggers for monitoring and diagnostics. This will increase the reliability of the signaling system. Train detection is proposed through digital axle counters. To ensure uninterrupted power, the system will have its own integrated power supply system with adequate battery backup.

24. The telecommunication system will primarily be based on 24 core optical fiber which will be laid all along the alignment. Additionally, 6 quads, 0.9 mm diameter telecom copper quad cable shall be provided at a constant and continuous separation all along the route. Block working and station to station communication shall be achieved using this cable. There shall also be a radio VHF communication for wireless point to point communication throughout the network. The VHF frequency to be used is the same as that for IR and DFC networks to make the communication interoperable and seamless.

25. **Track works.** The track proposed for HORC is broad gauge (1676 mm) ballasted track with 350mm ballast cushion. It will comprise of primarily long welded 60 kg 90 UTS rails laid on 60 kg PSC sleepers with a density of 1,660 per km. The track will be designed to be fit for axle load of 25T and a design speed of 160 kmph for passengers and 100 kmph for freight. Track works will be done under different packages. Rails and main line sleepers for Part A will be procured directly from IR.

26. **Public utility relocation arrangement.** HRIDC has collected data related to existing utilities along the alignment from various utility agencies and departments prior to the construction period. The removal of other overhead electrical utilities existing in the proposed HORC alignment is also being conducted. The status of major electrical crossings under Part A can be found in the table below.

Table A2.5: Status of Utility Shifting of HORC

Status of Utility Shifting of HORC						
Package	Electrical Crossing up to 33 kV ^a			Electrical Crossing above 33 kV ^b		
	Total	PDC	Status	Total	PDC	Status
C1	6	Q2 2022	Completed	4	Q4 2022	All 4 to be modified by HVPNL ^c .
C2	48	Q2 2023	46 Completed and 2 in progress	3	Q3 2023	i) 2 to be modified by HVPNL. ii) 1 to be modified by BBMB ^d .
C3	57	Q4 2023	Contract Awarded and work in progress	4	Q1 2024	i) 3 to be modified by HVPNL. ii) 1 to be modified by PGCIL ^e .

a Utility Shifting/modification bring carried out by HRIDC

b Utility Shifting/modification being carried out by respective Utility Owner

c HVPNL (Haryana Vidyut Prasaran Nigam Limited) – A Corporation under the jurisdiction of Government of Haryana.

d BBMB (Bhakra Beas Management Board) – A Corporation under the jurisdiction of Ministry of Power, Government of India.

e PGCIL (Power Grid Corporation of India Limited) – A Corporation under the jurisdiction of Ministry of Power, Government of India.

27. **Integration with IR and DFC.** The project, Part A of the HORC, will connect to 2 existing stations of IR and one of DFC. These interchanges will facilitate smooth flow of goods traffic between IR, DFC and HORC and will give more flexibility for operations. The technical parameters of HORC are being designed in such manner so that it is compatible for both IR and DFC network and same trains can seamlessly work between these networks.

28. HORC, at both the Prithala and New Harsana Kalan terminals, is connected to IR network. The take off at Prithala is from the DFC's New Pirthala yard, which in turn is to be connected simultaneously to two stations of IR – Asaoti and Palwal through a Y-connection. The Y-connection will ensure that the traffic coming from HORC can move either towards or away from Delhi as per requirement, thus providing additional flexibility. Connectivity through the DFC yard will also provide an interchange with the DFC network. At the other end, New Harsana Kalan station has been proposed on IR line that connects to the existing Harsana Kalan station of IR at both the up and down lines.

29. HORC will have the following interchanges.

Table A2.6: Interchanges at HORC

IR/DFC station	IR/DFC route	HORC interchange station
Patli (IR)	Delhi-Rewari section (IR)	Manesar (Part A)
		New Patli (Part A)
Sultanpur (IR)	Garhi Harsaru-Farukhnagar section (IR)	Badsa (Part B)
		New Patli (Part A)
Asaudah (IR)	Delhi-Rohtak section (IR)	Mandothi (Part B)
New Harsana Kalan (IR)	Delhi-Ambala section (IR)	New Harsana Kalan (Part B)
New Prithla (DFC)	Rewari-Dadri Section (DFC)	Prithla (Part B)
New Tauru (DFC)	Rewari-Dadri Section (DFC)	Dhulawat (Part A)

Source: HRIDC

30. **Phased operation approach.** As the HORC is planned to be connected to the existing Indian Railway network/DFC at 6 different locations (3 for Part A), rather than planning for commissioning of entire program in one go, commissioning has been planned by connecting different radial lines of existing Indian Railway network in 5 sections. Phased approach of operation will facilitate movement of trains on the sub sections of HORC.

31. Section-1: Connectivity from proposed Manesar station of HORC to Patli station on existing Delhi-Rewari-Ahmedabad IR line is planned for commissioning by December 2022 and December 2023 for its single line connectivity and double line connectivity of HORC main line, respectively. By commissioning this section, Manesar station of HORC will be connected to Delhi-Rewari-Ahmedabad line of IR network. Revenue will start generating once this section gets operational. This is included in Part A (this project).

32. Section-2: Commissioning of section 2 will connect proposed New Patli station of HORC with existing Garhi-Farukhnagar IR line at Sultanpur and also from New Patli to Patli station on Delhi-Rewari-Ahmedabad IR line. This section is planned for commissioning by December 2023. By commissioning this section, the traffic running from/to Farukhnagar towards Delhi-Rewari-Ahmedabad can be diverted through HORC which will bypass Garhi stations of IR. This will not only generate revenue but also save considerable running time. This is included in Part A (this project).

33. Section-3: This section is planned for commissioning by May 2024. It will cover the part from Manesar to Dhulawat. Once it is decided to provide a new connectivity to DFC from Dhulawat and all necessary approvals are obtained, a single line connectivity to DFC will also form part of this section. This is included in Part A (this project).

34. Section-4: Commissioning of section 4 will connect proposed Mandothi station of HORC with existing Delhi-Rohtak IR line at Asaudah and will also connect HORC with proposed New Harsana Kalan station on Delhi-Ambala-Amritsar/Chandigarh IR line. This section is planned for commissioning by May 2025. By commissioning this section, northern bound traffic meant for Delhi-Rewari-Ahmedabad route can be diverted through HORC and start generating revenue. In addition, this will also decongest the Delhi area. This is included in Part B.

35. Section-5: Commissioning of section 5 will connect proposed Prithla station of HORC with DFC network at New Prithala and also the existing Delhi-Mumbai IR line at Palwal (work of connectivity line from New Prithla station of DFC to Palwal station of IR being done by Northern Railway). With this, the entire HORC program will be operational by June 2025. The is included in Part B.

C. Implementation arrangement and schedule

36. **GoH.** GoH provides oversight for the implementation of the overall HORC program and the Part A project through the board of directors of HRIDC and HORCL to provide or cause to be provided, promptly as needed, the funds, facilities, services, and other resources: i) required for the project; and ii) necessary or appropriate to enable it and the HRIDC and HORCL to perform their obligations, respectively, under the project agreement.

37. **HRIDC.** As per Cabinet Committee on Economic Affairs (CCEA) approval dated September 15, 2020, the proposed project will be implemented by HRIDC. The project SPV, HORCL, will only be for financing the project from various stakeholders and banks/multilateral agencies/financial institutions.

38. HRIDC was incorporated in April 2017 as a JV between the Government of Haryana (51 percent participation) and Ministry of Railways (49 percent) in accordance with the Union Cabinet (GoI) decision to develop railway infrastructure through cooperative federalism with the State government and other stakeholders.

39. HRIDC is mandated to design, develop, plan, construct, operate, implement, and manage rail projects in the state of Haryana. It has the following objectives: (i) to identify, plan and implement the rail infrastructure projects, (ii) to collaborate with various stakeholders to plan and complement the development of railway infrastructure in the State, (iii) to generate greater financial resources through participation of the State, other stakeholders, including the private sector in project specific SPVs. One of HRIDC's projects is the HORC.

40. **HORCL.** Haryana Orbital Rail Corporation Limited (HORCL) is a project specific SPV incorporated on December 25, 2019, under the provisions of the Companies Act, 2013. According to the Concession agreement between HORCL (concessionaire) and MoR, this SPV is expected to undertake the development, financing, implementation, and operations and maintenance of the HORC project.

41. HRIDC and HORCL signed a construction agreement on February 16, 2022. As per the agreement, HRIDC will be responsible for financing, construction, and overall project implementation of the HORC Project, including project procurement, management of project funds and related financial management, review of design and works plans, and monitoring of construction progress.

42. The shareholders of HORCL include three public sector undertakings (PSUs) and two equity investors. The PSUs include HRIDC, Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) and Gurgaon Metropolitan Development Authority (GMDA).

The private sector stakeholders include Maruti Suzuki India Limited (MSIL) and All Cargo Logistics Limited (ACL).⁸ The program will be funded with equity contribution from the above-mentioned stakeholders as detailed in the table below.

Table A2.7: Equity stakeholders of the HORC program

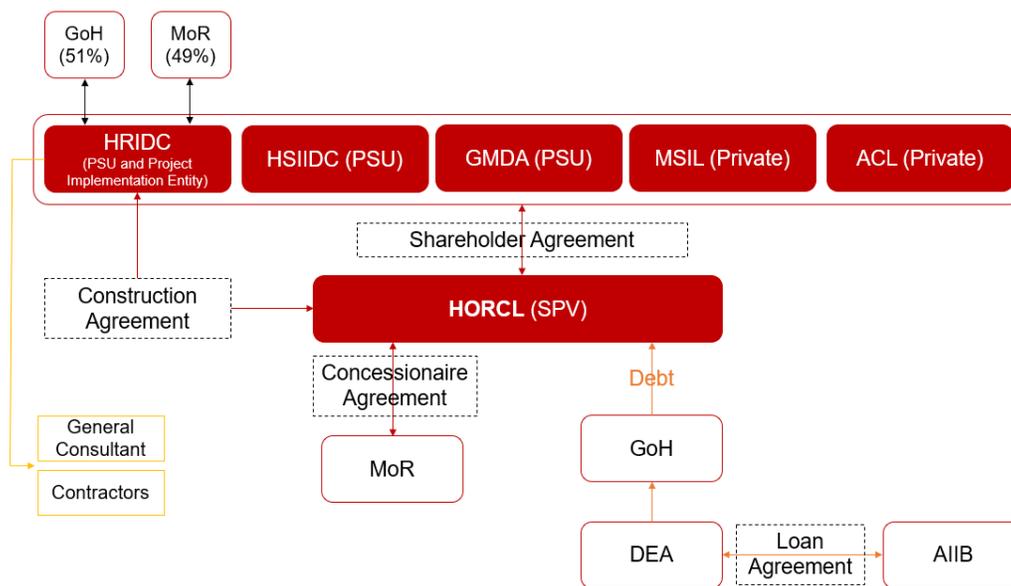
Equity Stakeholder	% Equity Share for INR 1500 crore (USD 200.70 million) equity
Haryana Rail Infrastructure Development Corporation (HRIDC)	INR 831 Crore (55.4%)
Haryana State Industrial and Infrastructure Development Corporation (HSIIDC)	INR 285 Crore (19%)
Gurgaon Metropolitan Development Authority (GMDA)	INR 75 Crore (5%)
Maruti Suzuki India Limited (MSIL)	INR 195 Crore (13%)
All Cargo Logistics (ACL)	INR 114 Crore (7.6%)

Source: HRIDC

43. The organizations involved in the project and their relationships are shown below.

⁸ Equity participation came about when HRIDC hosted an outreach event for private sector stakeholders in February 2019 to solicit equity investment in the program. HRIDC conducted further meetings and held discussions with various public and private entities that are in the logistics business along the HORC program alignment. The two equity investors are all logistics businesses. These two investors are not connected to the rail network and are transporting their freight to nearby rail heads by road trailers for further transport by rail. As Delhi NCR acts as a hub with radial connectivity to nearby cities, the investors are anticipating growth of freight movement in Delhi NCR region which will also lead to increase in the number of logistics parks in the region.

Figure A2.2: Organizational structure



Source: HRIDC

44. **Implementation Schedule.** HRIDC plans to commission the entire HOCR program by June 2025. The GC will prepare and regularly update a detailed implementation program in consideration of technical challenges, internal and external coordination, which will be regularly reviewed by AIB during the project implementation.

D. Operation and Maintenance

45. O&M responsibilities will be governed by a Concession Agreement signed between MoR, Government of India and HORCL. The proposed agreement is based on the JV model of IR as specified in the Policy for Participative Models in Rail Connectivity and Capacity Augmentation of Projects dated December 10, 2012, for construction, operation and maintenance of HOCR. Accordingly, station and train operations will be managed by MoR through its nominated zones and maintenance will be the responsibility of HOCR. MoR will also perform services such as booking and delivery of consignments, rolling stock examinations, maintenance and replacement of rolling stock and payment of power bills for electric traction and platform lighting. HORCL will be responsible for periodic maintenance of the rail system, repairs, replacements and overhaul of the infrastructure (i.e., fixed assets) and maintaining certain key performance indicators.

Annex 3: Economic and Financial Analysis

A. Economic Analysis

Introduction

1. The economic viability of the entire HORC program was assessed using a Cost-Benefit Analysis by comparing “with-project” and “without project” scenarios. The economic internal rate of return (EIRR) was calculated by comparing the economic benefits of the program with the cost of the program over a period of 30 years. The analysis indicates that the program is economically viable with an EIRR of 14.59 percent, well above the social discount rate of 9.0 percent. The program also yields an NPV of INR 40.9 billion at this discount rate. Sensitivity analysis involving rise in costs and decline in benefits indicate the program remains viable even under large negative shocks.

Demand Analysis

2. The traffic demand estimates for the HORC program are derived from the Detailed Project Report (DPR) based on growth in GDP and population and modal shift from other vehicle categories. Ridership is estimated to increase at the rate of population growth with the additional demand being met by introducing more trains during the program life. The freight traffic demand is made up of (a) modal shift of freight from existing railway routes, (b) diversion of freight from existing road-based modes and (c) incremental traffic due to future expansion of industries and logistic centers. For rail-to-rail diversion, majority of divertible freight traffic will come from Delhi-Rohtak and Delhi-Panipat sections. The projected freight traffic to be diverted from the original IR route to HORC is 49.7 trains per day or 59 million metric tons per annum. Out of the 106 daily freight trains that are handled by IR and passing through the Delhi area, this indicates a 46.8 percent diversion rate. Commodities transported from rail-to-rail diverted traffic are coal, food grains and containers,⁹ while those transported from road-to-rail diverted traffic are automotive, cement, container, food grains and iron and steel. New industrial traffic will handle automotive parts and vehicles and containerized commodities.

3. Traffic for Part A is expected to come from the new industrial traffic. This traffic comprises the existing Maruti Suzuki plant at Manesar and the planned All Cargo Logistics. Overtime, more industrial centers, and logistics hubs are expected to be built around the HORC alignment. At present, 2.58 trains per day from the Maruti siding at Manesar is anticipated during the first year of operations of Part A.¹⁰

⁹ HORC's coal freight traffic is expected to stagnate beyond 2032 since it has been assumed that after 2032, no new thermal power plants in Haryana and Punjab will be constructed. For the existing power plants, coal requirement is taken as constant after 2032 (i.e., zero growth). Coal traffic in HORC is expected to come via eastern DFC to Pirthala towards power plants located in Northern India. The share of coal in total traffic is expected to decrease from 27.4% in 2028 to 23.2% (2042), 17.7% (2052), 12.7% (2062) and 8.4% (2072). The program remains economically viable even when coal traffic is discounted in the analysis.

¹⁰ Without the HORC, Maruti Suzuki is transporting its freight to nearby rail heads by road trailers for further transport by rail. IR rail loading points for Maruti to deliver the cars to outbound destinations include Gurugram, Farukhnagar,

Cost Estimates

4. The overall cost includes both the capital expenditure and the O&M costs. The capital expenditure covers the cost of acquiring land, preparing earth works, building permanent ways or railway tracks, bridges, stations, staff quarters and offices, signaling and telecommunication at stations and overhead equipment.¹¹ Since some of the institutional strengthening and capacity building components are also expected to contribute to the benefits of the program, they are also included. The financial cost is converted to economic cost using conversion factors outlined in *Appraisal Guidelines for Metro Rail Projects, Ministry of Housing and Urban Affairs, 2017*. The capital cost is calculated as INR 51.66 billion (USD 691.2 million).

5. The O&M costs include both fixed and variable costs. The fixed costs cover manpower cost and other fixed maintenance cost while the variable cost includes cost of fuel, hiring charges of rolling stock, wagon repair charges, vehicle hire charges etc.¹² Additionally, overhead costs in excess of fixed and variable costs are also considered. These costs are again converted to economic costs using appropriate conversion factors. The overall O&M costs is calculated as INR132.3 billion (USD 1.77 billion).

6. Finally, salvage value is considered as 20 percent of capital cost at the end of analysis period and is treated as a negative cost.¹³

Economic Benefits

7. The main beneficiaries would be the passengers, business owners, and the logistic companies. The benefits will accrue from (a) reduced travel time, (b) reduction in vehicle operating cost (VoT), (c) fewer accidents, (d) lower pollution, and (e) savings in infrastructure spending. The economic benefits have been estimated based on passengers shifting to the metro from other modes as outlined below.

Table A3.1: Change in Modal Share

Mode	Current Modal Share	Future Modal Share	Passengers Shifting to HORC
Car	63%	59%	30%
2-wheeler	17%	13%	26%
Bus	14%	7%	44%
Others	6%	6%	0%
HORC	Nil	15%	...

Source: Detailed project report

Bawal, Kathuwas, and Patli. On average, about 3,000 truck trips are used per month to deliver the cars. With the execution of Part A, Maruti will commence loading from its existing plant at Manesar. Thus, it will reduce Maruti traffic on road destined for various loading points of IR within the 100 km radius.

¹¹ In this analysis the cost of land acquisition includes both the market value of the land (approximating the economic cost of the land) and the rehabilitation and resettlement cost given to landowners. This reflects a very conservative approach of conducting the Economic Analysis as the economic cost of land is typically around 40% of the land acquisition cost with the remaining cost reflecting transfers to the landowners under the applicable laws in India.

¹² The O&M costs are benchmarked to the Kutch Railways for 2016-17 with the appropriate escalation factor.

¹³ This is in line with similar projects in India like Chennai Metro Balance Corridor 5 and Mumbai Metro.

- i. **Reduced Journey Time:** The journey time savings are calculated for people who will shift from road to HORC as the latter will be significantly faster than alternate-road based transport modes. In line with other studies the value of time is based on Haryana's per capita income of INR 213,889 in 2021, working population ratio of 31.1 percent and an assumption of 300 working days per year. This yields an average VOT of INR 208.9 per hour. The analysis assumes a 25 percent higher than average VOT for car passengers. The VOT for bus and 2-wheeler passengers is assumed to be 50 percent lower than the average. Furthermore, the VOT of non-working adult is assumed to be 30 percent of VOT working adult while the VOT of non-working children is assumed to be 15 percent of VOT working adult.

An additional benefit of passengers shifting to HORC would be the reduced congestion on the road that will allow the remaining vehicles on the road to ply at a higher speed. It has been assumed that speed of various vehicle categories remaining on road will increase by 25 percent with the introduction of HORC.¹⁴

The introduction of the HORC would also result in significant savings in working capital due to decreased travel time for freight (a) shifting from road to HORC and (b) shifting from Indian Railways to HORC. Additionally, there will be additional spare capacity on the Indian Railway network as freight shifts to HORC.

- ii. **Savings in Vehicle Operating Costs (VOC):** The savings in VOC is a result of passengers and freight shifting from road-based vehicles like buses, cars, two-wheelers, buses, LCV and HCV to HORC. This would result in lower congestion on the road and reduce the demand for vehicles. The VOC depends on roughness of road, other road characteristics, vehicle type and speed of vehicle. VOC unit cost per km is derived from Indian Road Congress's Manual on Economic Evaluation of Highway Projects. The original estimates are for 2009 and have been adjusted for 2021 using 5 percent escalation per year. The savings are calculated based on reduction in trips and distance covered by vehicles on the road. The average trip length for passengers is estimated to be 50 kms while the average trip length for freight is estimated to be 93 kms.
- iii. **Reduction in Accidents:** With a reduction in number of vehicles on the road there will be a drop in accidents. However, as the lower congestion on the road will result in higher speed, the reduction in accidents may not be linear. As a conservative approach it is assumed that accidents will be reduced by only 50 percent compared to what the reduction in vehicles would otherwise entail. The benefits include reduction in fatal accidents, reduction in major accidents resulting in serious injuries and damages to buses, cars and two-wheelers.

¹⁴ Introduction of new vehicles in both the "with-project" and "without project" scenario would result in speed decreasing during the project lifetime.

- iv. **Road Infrastructure Savings:** The reduction in vehicles traveling on the road will also help reduce the wear and tear of the road. This, in turn, will reduce the expenditure on road infrastructure compared to the 'without program' scenario.
- v. **Reduction in Emissions:** By reducing the number of vehicles on the road and allowing remaining vehicle to travel at a higher speed due to lower congestion, the program will result in substantial reduction in GHG emissions even after including GHG emissions resulting from operating HORC. The CO₂ emission factor of vehicles is assumed as 139.52 g/km for cars, 28.58 g/km for 2-wheelers, 787.72 g/km for buses, 401.25 g/km for LCVs, 602.01 g/km for HCV and 762.39 g/km for multi-axis vehicles.

8. The various benefits and costs are outlined in Table A3.2 below. In the baseline case, the program has an EIRR of 14.59 percent, well above the social discount rate of 9.0 percent. The NPV of the program at 9.0 percent discount rate is estimated at INR 40,930.35 million. Thus, majority of the benefits arise from reduction in journey time for passengers and freight, followed by savings in vehicle operating costs and reduction in greenhouse gas emissions.

Table A3.2: Annual Costs and Benefits

Year	Cost (INR Million)		Benefits (INR Million)					Net Benefits (INR Crores)
	Capital Costs	O&M Cost	Time Savings	Distance related VoC	Accident Reduction	Road Infrastructure Savings	Emission reduction	
2023	5688.83	0.00	0.00	0.00	0.00	0.00	0.00	-5688.83
2024	16718.43	42.47	0.00	0.00	0.00	0.00	0.00	-16760.90
2025	15494.44	784.64	0.00	0.00	0.00	0.00	0.00	-16279.08
2026	13757.25	1298.97	0.00	0.00	0.00	0.00	0.00	-15056.22
2027	0.00	1505.51	0.00	1356.06	3.73	71.25	25.29	-49.17
2028	0.00	4543.98	6409.60	1712.35	4.51	85.87	60.27	3728.63
2029	0.00	2534.80	6743.39	2162.24	5.46	103.44	119.89	6599.63
2030	0.00	2534.80	7112.95	2730.34	6.60	124.58	213.73	7653.41
2031	0.00	4630.15	7530.64	3447.71	7.98	150.08	319.07	6825.33
2032	0.00	4720.23	9876.64	4353.55	9.66	180.87	457.51	10158.00
2033	0.00	4814.40	10525.87	4538.38	10.21	186.35	485.94	10932.35
2034	0.00	4912.87	11227.79	4731.05	10.80	192.01	523.58	11772.36
2035	0.00	4962.39	11987.47	4931.91	11.43	197.93	563.78	12730.12
2036	0.00	5014.34	12810.51	5141.30	12.09	203.93	606.69	13760.17
2037	0.00	5068.87	12192.02	5359.57	12.79	210.19	652.49	13358.19
2038	0.00	5126.13	12989.18	5616.71	13.42	217.50	708.85	14419.53
2039	0.00	5186.28	13851.03	5886.18	14.08	224.98	765.75	15555.75
2040	0.00	5249.50	14783.81	6168.59	14.78	232.81	844.09	16794.59
2041	0.00	5315.96	15794.40	6464.54	15.51	240.90	910.07	18109.46
2042	0.00	5385.88	15063.71	6774.69	16.28	249.26	980.84	17698.89
2043	0.00	5459.46	16025.96	7137.28	17.00	259.00	1066.64	19046.43
2044	0.00	5536.92	17066.43	7519.28	17.76	269.18	1154.76	20490.49
2045	0.00	5618.52	18192.72	7921.72	18.55	279.79	1249.84	22044.11
2046	0.00	5704.50	19413.25	8345.71	19.37	290.75	1352.39	23716.97
2047	0.00	5795.16	18639.68	8792.38	20.23	302.24	1462.96	23422.33
2048	0.00	5890.79	19848.31	9309.85	21.06	315.55	1594.57	25198.54
2049	0.00	5991.72	21155.99	9857.76	21.92	329.56	1732.76	27106.27
2050	0.00	6098.29	22572.36	10437.93	22.82	344.17	1904.43	29183.42
2051	0.00	6210.87	24108.10	11052.24	23.76	359.40	2067.38	31400.02
2052	-10331.79	6329.86	23111.63	11702.71	24.73	375.23	2243.85	41460.08
							EIRR	14.59%
							NPV	₹ 40,930.35

Sensitivity Analysis

9. The robustness of the economic viability of the HORC program is evaluated by making alternate assumptions about the stream of costs and benefits. The economic viability of the program is assessed if (a) costs increase by 20%, (b) benefits decline by 20% and (c) both (a) and (b) happen. The HORC is found to be economically viable under all these conditions with the EIRR being above the social discount rate and a positive NPV.

Table A3.3: Sensitivity Analysis

	EIRR	NPV (INR Million)
Baseline	14.59%	40,930.35
Increase Costs by 20%	12.25%	26,407.41
Decrease Benefits by 20%	11.74%	18,221.34
Increase Costs by 20% and Decrease Benefits by 20%	9.50%	3,698.39

B. Financial Analysis

10. The financial analysis can be conducted from the point of view of the entire program and/or for a specific entity. When conducting an analysis for the entire program, all program revenues (i.e., passenger and freight revenues for a rail project) as well as capital and O&M expenses are accounted for in the analysis. When conducting financial analysis at the entity level, this accounts for context-specific arrangements between the entity and its partners (e.g., MoR) and not all costs or revenues may be accrued to the entity. This financial analysis focuses on the entity level and for the HORC program.

11. In this case, HORCL is the entity as it is the signatory of the concession contract with MOR. Based on this concession contract, IR shall own the passenger revenues and 50 percent of the revenues from freight operations, in exchange for providing a defined set of operation and maintenance services as per the Ministry of Railways framework of “Model Agreement for Construction, Operation and Maintenance of the Rail System through Joint Venture”¹⁵. These revenue and cost assignments are reflected in the financial analysis.

12. The financial analysis uses the discounted cash-flow method to calculate the FIRR, entity level NPV and DSCR over a period of 50 years, including 4 years of construction and 46 years of operation.

13. **Capital Costs.** The capital costs were obtained from the Detailed Project Report (DPR, dated January 2020 for the program). The costs were escalated to FY2022, the base date assumed for financial analysis. HRIDC also conducted further revisions to include certain soft costs that were not considered to adequate extent in the DPR. Total program costs include land, tracks, power lines, S&T, civil works, and soft costs such as contingency, escalation, interest during construction and other financing related costs.

14. **Post commissioning capital expenses.** The capital cost also provided for post construction outlay, behind replacement needs (as per wear and tear of signaling, telecom, tracks and electrical assets). Financial analysis assumed that (i) senior debt would be serviced before spending on these outlays (ii) internal generation would cater to these requirements, with sponsors’ arranging for deficiencies, if any that arise.

15. **Operations and Maintenance (O&M) cost.** HORC would be required to provide for only the regular maintenance and upkeep of their fixed assets, while all costs relating to train operations including fuel and energy, maintenance and replacement of rolling stocks and related would be managed by IR. To estimate the operating expenses, Kutch Railway Company Limited (KRCL) was reckoned as the closest comparable for HORC’s scheme of operations (and benchmarked with Analysis of Operating Expense as per Annual Statistics Statement 2019-20, Northern Railway, Government of India).¹⁶ Unit operating costs of KRCL (FY2017 audited

¹⁵ https://indianrailways.gov.in/railwayboard/uploads/directorate/infra/downloads/Draft_Model_JV.pdf

¹⁶ KRCL is a special purpose vehicle akin to HORC, set up to undertake gauge conversion of Gandhidham - Palanpur (in Gujarat, India). Commercial operations on KRCL section started from July 1, 2006. KRCL operates under an Operations and Maintenance Agreement with the Western Railways, Government of India, similar to the arrangement proposed by HORCL. Technical and operational aspects proposed by HORC is found to be similar to the practices

numbers appropriately escalated) was taken for each of the operational years – proportionate to the extent of commissioning every year. Operating Expenses was assumed to escalate at 8 percent for manpower costs and 5 percent for other operating costs.

16. **Freight Demand and Revenue.** Freight demand is the main revenue source for the corridor and was reckoned to arise (a) from existing rail routes, (b) from a shift of road traffic to (HORC) rail mode and (c) from industrial hinterlands that this alignment would cater to. Freight revenues were calculated using haulage rates as per Indian Railway rates – available, commodity wise and travel route length wise. An annual escalation of 3 percent to the base haulage structure is conservatively assumed for the analysis. Non farebox revenues were conservatively assumed at 5 percent of freight revenues and to accrue from FY2027.

17. **Weighted Average Cost of Capital.** WACC was calculated considering that AIIB debt would be interest bearing while balance of the financing needs would be met by shareholders through equity and quasi equity infusions. Cost of debt was based on aggregate of 6-month SOFR,¹⁷ the spread (as per AIIB pricing policy for sovereign-backed loans), front-end, and commitment fees. AIIB loan was taken to be hedged. Post tax cost of debt was calculated using applicable corporate tax rate. Cost of Government of India's 10-year bond yield,¹⁸ together with a markup for tenure and yield premium over the sovereign rate (together, assumed conservatively at 1 percent) was taken as the cost of equity funds. Tax adjustments (at applicable rates for debt funds and at Nil rate for equity) were assumed and nominal rates were converted to real using domestic and overseas inflation rates, respectively at 4.0 and 3.5 percent.¹⁹ The post-tax WACC, in real terms, worked out to 2.54 percent.

18. **Outcome of the financial analysis.** The calculations for post-tax FIRR were carried out based on the assumptions mentioned above. While the entire analysis was done in nominal terms, cash flows on nominal basis from financial statements were adjusted for the inflation to aid calculation of FIRR in real terms. Program cost was also deflated so that they are kept at real terms.

19. The post-tax real FIRR is 8.54 percent, and this included consideration of a salvage value behind the initial and operational life additions to the capital assets. NPV of the enterprise level cash flows, in real terms, discounted at 3.70 percent - the assumed post tax, real cost of equity funds worked out to INR 62.76 billion. The DSCR remains above 1.0 times during the loan repayment period with a minimum of 2.06 times and an average of 3.45 times. The program demonstrates positive benefit in the base case but, viewed together with the risks associated with

handled by KRCL. Most importantly, overall freight traffic volume, and composition of freight are found to be largely similar for both Kutch Railway and HORC.

¹⁷ <https://www.cmegroup.com/market-data/cme-group-benchmark-administration/term-sofr.html> accessed on March 24, 2022

¹⁸ <http://www.worldgovernmentbonds.com/bond-historical-data/india/10-years/> accessed on April 1, 2022

¹⁹ Indian inflation is as per the amendment to RBI act dated May 14, 2016, and corresponding accepted recommendations of Governor of Reserve Bank of India committee report. US inflation is as per IMF Data mapper, accessed on March 22, 2022, <https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOORLD>

a program of this nature and magnitude, the vulnerability of this NPV to the impacts of sensitivity factors have been analyzed.

Table A3.4: FIRR Calculation in INR million (Base Case Scenario)

Financial Year ending	Implementation and Operational period Capital Cost	Operating Expenses (HORCs share)	Freight Revenue (HORCs share)	Non farebox Revenue	Total Revenue (HORCs share)	EBIDTA	EBIDTA	EBID, after Tax	Net Capital and Operational Cash Flow
						<i>Nominal</i>	<i>Real</i>	<i>Real</i>	<i>Real</i>
2023	6721.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6721.16
2024	19152.87	20.07	264.45	0.00	264.45	244.38	234.98	175.83	-18977.03
2025	16126.93	127.92	1595.36	0.00	1595.36	1467.44	1356.73	1015.24	-15111.68
2026	13635.00	460.66	5437.46	0.00	5437.46	4976.80	4424.36	3310.75	-10324.25
2027	0.00	528.35	5901.78	590.18	6491.95	5963.60	5097.71	4129.36	4129.36
2028	0.00	558.40	6321.22	632.12	6953.34	6394.94	5256.17	4247.94	4247.94
2029	0.00	590.24	6771.83	677.18	7449.01	6858.77	5420.59	4370.97	4370.97
2030	0.00	623.99	7256.01	725.60	7981.62	7357.63	5591.19	4498.63	4498.63
2031	0.00	659.76	7776.36	777.64	8554.00	7894.23	5768.24	4631.12	4631.12
2032	0.00	697.69	8335.67	833.57	9169.24	8471.55	5952.00	4768.63	4768.63
2033	0.00	737.91	8720.82	872.08	9592.90	8854.99	5982.11	4791.16	4791.16
2034	0.00	780.57	9128.64	912.86	10041.50	9260.93	6015.72	4816.31	4816.31
2035	0.00	825.82	9560.79	956.08	10516.87	9691.05	6053.00	4844.21	4844.21
2036	0.00	873.83	10019.09	1001.91	11021.00	10147.17	6094.13	4874.98	4874.98
2037	0.00	924.78	10505.49	1050.55	11556.04	10631.26	6139.29	4908.77	4908.77
2042	0.00	1230.72	13440.52	1344.05	14784.57	13553.86	6433.23	5128.74	5128.74
2047	0.00	1644.86	17493.20	1749.32	19242.52	17597.66	6865.23	5441.76	5441.76
2052	0.00	2208.20	23211.62	2321.16	25532.79	23324.59	7479.06	5962.73	5962.73
2057	0.00	2978.29	31462.33	3146.23	34608.56	31630.27	8336.22	6604.14	6604.14
2062	0.00	4036.23	43636.39	4363.64	48000.03	43963.80	9523.46	7492.56	7492.56
2067	0.00	5496.81	61998.39	6199.84	68198.23	62701.42	11163.76	9080.63	9080.63
2072	-4615.09	7523.03	90281.31	9028.13	99309.44	91786.40	13432.13	10778.05	15393.14
								FIRR	8.54%

20. The profitability projections indicate operational viability²⁰ for all the years under study. Sensitivity of FIRR and to NPV to any likely increase in program cost, increase in operating expenses, decrease in revenue share by IR, decrease in freight traffic from any or all of the three sources (i.e., rail to HORC, road to HORC and from new industrial traffic), decrease in haulage rates applicable for each of the commodities etc., are listed under Table A4.5. The results indicate that FIRR, NPV and DSCR are vulnerable to get lower than the discounting rate under certain adverse stress scenarios that involve the above parameters. The table below gives the FIRR and minimum DSCR for the sensitivity parameters and for few scenarios as well.

²⁰ Defined as operational revenue (freight and non-farebox) less operational expenses (staff salary and wages and other fixed costs for HORC). Interest expense (finance cost) is not part of operational expenses.

Table A3.5: Sensitivity Analysis

	Notation	FIRR	NPV (Discounting at cost of equity – the opportunity cost for shareholders)	Minimum DSCR over AIIB Loan Repayment Period
		percent	INR billion	times
Base Case		8.54%	62.76	2.06
Sensitivity Tests				
Share of Revenue from Indian railways decreases to 40% (i.e., HORC gets only 40% share as against the base case of 50%)	A	7.03%	41.39	1.87
Hard Costs increase by 20%	B	7.58%	56.30	2.20
Rail to HORC freight traffic decreases by 20%	C	7.15%	43.71	1.88
Road to HORC freight traffic decreases by 20%	D	8.39%	59.41	2.04
New industrial traffic decreases by 20%	E	8.47%	61.86	2.04
Applicable haulage rates across commodities decrease by 20%	F	6.88%	39.35	1.83
Operating expenses increase by 20%	G	8.41%	60.84	2.03
Scenario Tests				
Scenario 1 = C + D + E <i>All three contributors of freight get impacted</i>	H	6.89%	39.46	1.83
Scenario 2 = A + H <i>Revenue Share and Freight from all three contributors get impacted</i>		5.59%	22.35	1.46
Scenario 3 = A + F + H <i>Revenue Share, Applicable Haulage rates and Freight from all three contributors get impacted</i>		4.32%	7.02	1.13
Scenario 4 = A + F + G + H <i>Revenue Share, Applicable Haulage rates, Operating Expenses, Freight from all three contributors – all get impacted</i>		4.16%	5.10	1.09
Scenario 5 = A + B + F + G + H <i>Revenue Share, Program Cost, Applicable Haulage rates, Operating Expenses, Freight from all three contributors – all get impacted</i>		3.59%	(1.36)	1.09

Annex 4: Paris Agreement Alignment and GHG emissions Assessment

1. AIIB has committed to fully align its operations with the goal of the Paris Agreement by July 2023. While the project is intended to commence implementation ahead of this deadline it was deemed important to consider capturing the potential climate considerations of the project. The Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations provides an approach to assess the mitigation (labeled BB1, in the Joint MDB methodology) and adaptation (labeled BB2, in the Joint MDB methodology) alignment of the project. To be considered fully aligned with PA, the project must meet both PA's climate mitigation and adaptation goals.

A. PA Alignment in Climate Mitigation (BB1)

2. The project, being an electric rail infrastructure, is categorized under the 'universally aligned' list. This means that the project contributes to climate action that is consistent with the mitigation goals of the PA. Hence, no further assessment is needed.

3. Nevertheless, the HORC program will contribute to climate change mitigation by (i) encouraging commuters to shift from road-based transport to rail based electric-tracked public transport and (ii) reducing congestion on the existing IR network, thereby allowing IR to be able to run more passenger trains on existing routes. Section C provides an estimate of the GHG emissions reductions contribution of the HORC program.

B. PA Alignment in Climate Adaptation (BB2)

4. The Joint MDB methodology for assessing the investment's climate adaptation alignment with the PA consists of the following:

- (i) *Climate risk and vulnerability assessment*: Identify and assess physical climate risk to determine whether the railway infrastructure and its users are vulnerable to climate hazards;
- (ii) *Climate adaptation and resilience measure definitions*: Propose measures to address the identified physical climate risks and support the delivery of climate-resilient railway infrastructure; and
- (iii) *Consistency with broader and national context for climate resilience*: Ensure that the railway operation is consistent with the policies/strategies/plans for climate adaptation and resilience at the national, regional, local, city, level as considered relevant and/or with private sector or community-driven priorities.

5. *Climate risk and vulnerability assessment*. A climate and geological risk and vulnerability assessment was conducted for the HORC program. The assessment revealed three major risks that can impact the HORC alignment, namely: (i) flooding due to extreme rainfall events especially during monsoon periods, (ii) increase in annual average temperature, and (iii) earthquake risks (specifically, all districts in Haryana state lie in Zone IV and high damage earthquake risk zone).

Such risks could have adverse impacts. For example, air temperature increase can accelerate buckling of rail tracks, thereby causing metal to expand and puts it at risk of rail misalignment when the weight of train cars put stress in areas that are weakened by exposure to excessive heat. Precipitation increase and increase in intense precipitation events can cause overloading of drainage systems, causing backups, flooding, and track formation washouts. Considering these risks, the project carefully considered rail design and introduced new technologies to adapt to such risks.

6. *Climate adaptation and resilient measures.* Climate change adaptation features envisioned in the project design are the following:

- (i) Extreme temperature increase: The use of 60 kilogram (T-12) - prime quality steel rails is proposed. This is a product of recent advances in special heat treatment of steel that achieves an increase in hardness by nearly 50% in comparison with standard steel grades. This is adopted throughout all new constructions across Indian Railways under RDSO's specifications, including for this project.²¹
- (ii) Reduced availability of water during construction and operation of railway line due to temperature increase: Construction of rainwater harvesting structures at stations is proposed to facilitate percolation of runoff into the ground as per approved design by the Central Ground Water Board,²² as well as to conserve and augment the storage of ground water.
- (iii) Increased precipitation resulting in flooding: Side drains are proposed in the segments where the railway formation is in cuttings and running through village areas as per Indian Railways Permanent Way Manual (IRPWM), 2019.
- (iv) Flooding: All bridges are expected to have drop walls and curtain walls to adapt to flooding risks. This is a standard design practice of RDSO.²³ Note however that no major river is crossing the HOCR alignment. The nearest river, Yamuna, is far away from HOCR alignment which obviates the possibility of flooding on HOCR due to the said River.
- (v) Earthquake hazard: The project design has been adopted as per Seismic Zone IV seismicity. The standards for earthquake resistant design are given in IS1893:2002 – Code for earthquake resistant design of structures.

7. Total climate adaptation finance for the HOCR amounts to INR 40.5 million (around USD 542,000). Note that some of the adaptation features incorporated into project design are standard practice in India and hence are not included in the costing calculations.

²¹ The standard rail section is given in Indian Railways Permanent Way Manual, 2019.

²² The guidelines as mentioned in the Manual on Artificial Recharge of Ground Water issued by the Central Ground Water Board will be adopted for roof top rainwater harvesting.

²³ The standards for curtain and drop walls are provided in the Indian Railways Bridge Manual (IRBM) 1998.

8. *Consistency with Broader and National Context for Climate Resilience.* The railway project is consistent with national policies and strategies for climate mitigation and adaptation. The climate adaptation measures integrated into the design of the project are also aligned with the national policies of India.

9. During the COP26 Summit in Glasgow last October 2021, the Prime Minister of India identified 5 emissions pledges that seek to control India's emissions, namely: net-zero emissions by 2070; achieving non-fossil fuel energy capacity of 500 GW by 2030; 50 percent of its energy requirements from renewable sources by 2030; reducing the total projected carbon emissions by 1 billion tonnes from now until 2030; and reducing the carbon intensity of the economy to less than 45% by 2030.²⁴ India's Intended Nationally Determined Commitments (NDC) submitted to the UN Framework Convention on Climate Change in October 2015 also committed to reduce the emissions intensity of its GDP by 33-35 percent by 2030 from the 2005 level as well as to better adapt to climate change by enhancing investments in sectors vulnerable to climate change. Mitigation strategies were identified, including establishing a clean and efficient energy system; enhancing energy efficiency in industries; developing climate resilient urban centers; promoting waste to wealth conversion; establishing safe, smart and sustainable green transportation network; planned afforestation; ensuring abatement of pollution; and enhancing citizen and private sector contribution to combating climate change. As part of the 'establishing safe, smart and sustainable green transportation network' strategy, the document cited that India is focusing on low carbon infrastructure and public transport systems including energy efficient railways to reduce their environmental impacts.²⁵ It can be noted that, similar to the existing electric railways initiative in India, HORC will contribute to GHG emissions reduction by providing an alternative transport mode compared to other carbon-intensive modes such as roads (see Section C). The project also contributes to India's NDC goals on adaptation by considering climate change risks (e.g., extreme temperature, flooding) and incorporating adaptation measures into the design of the program.

C. GHG Emissions Assessment

10. The HORC program supports climate change mitigation by encouraging commuters and freight to shift from road-based transport to the HORC. Also, HORC will reduce congestion on the existing IR network in Delhi, since IR will be able to run more passenger trains on existing routes (these passengers would otherwise have used road-based transport).

11. Calculations on the reductions in carbon dioxide (CO₂) emissions due to shifts of passengers from roads to the HORC and IR network show that the average annual GHG emissions reductions is estimated at 61,100 tCO₂ annually for the HORC program.

²⁴ <https://pib.gov.in/PressReleasePage.aspx?PRID=1768712>

²⁵ <https://unfccc.int/sites/default/files/NDC/2022-06/INDIA%20INDC%20TO%20UNFCCC.pdf>

Table A4.2: GHG Net Emission Savings Calculation

Year	Baseline Emissions		Program Emissions	Net Emission Savings (tCO ₂ /year)
	Due to passenger shift (tCO ₂ /year)	Due to freight shift (tCO ₂ /year)	From passenger and freight transport (tCO ₂ /year)	
2027	41,868	19,063	41,749	19,181
2032	48,407	28,363	49,983	26,785
2037	53,084	42,295	55,928	39,454
2042	58,509	63,202	62,284	59,426
2047	64,821	94,623	70,509	88,932
2052	72,187	141,917	81,282	132,822
Total	338,876	389,463	361,735	
Average savings per Annum				61,100

12. The calculations assume the following:

- (i) Deducting HORC's emissions during operations (those from electricity generated for the operation of the HORC) from CO₂ emission savings.
- (ii) Not including the emissions during rail construction. This has not been included since the baseline (road) has comparable construction emissions plus the upstream emissions of vehicle production in the baseline is much higher than that of rail carriages.
- (iii) Emissions factors:
 - i. Cars: 0.140 kg per kilometer (kg/km); buses: 0.788 kg/km; and two-wheelers 0.029 kg/km. These are taken from the Ministry of Housing and Urban Affairs guidelines.
 - ii. LCV and others: 0.401 kg per kilometer (kg/km); 2 Axle HCV: 0.602kg/km; and Multi Axle HCV 0.762 kg/km. These are taken from the Draft report on "Emission Factor development for Indian Vehicles" as part of Ambient Air Quality Monitoring and Emission Source Apportionment Studies.
 - iii. Power grid emission factor for HORC's operations: 0.79 tCO₂ per MWh. This is taken from CO₂ Baseline Database for the Indian Power Sector, March 2021, Government of India Ministry of Power Central Electricity Authority.

13. Based on the PA alignment assessment using the joint MDB methodology and the GHG emissions assessment, it can be concluded that the program is fully aligned with PA. Moreover, the program contributes to net GHG emissions savings.

Annex 5: Gender Equality, Inclusion and Equitable Transport

1. With a value of 0.488 and above the world average, India ranks 123 (2019) in the United Nations' gender inequality index (GII)²⁶, below neighboring Nepal and Sri Lanka but above Bangladesh and Pakistan. Similar to the GINI coefficient²⁷, the GII indicates male and female inequality across health, empowerment and labor market dimensions. India, however, performed lower than the world average (0.943) in the UN Gender Development Indicator (GDI) where it measured 0.820 in 2019. The GDI is a ratio of the UN female and male human development indicators; if above 1 the human development indicator is higher for women than for men. With a score of 0.625, India also ranks 140 (2020) in the World Economic Forum's Global Gender Gap Index which measures gender gap across economic participation and opportunity, educational attainment, health and survival and political empowerment²⁸.

2. India has signed Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) in 1980 and ratified it in 1993; it has not yet ratified the Optional Protocol to CEDAW²⁹. India has endorsed the Beijing Platform for Action (BPFA) and committed to the Sustainable Development Goals (SDGs) in 2015. Government of India has made significant efforts to integrate the international principles and instruments into legislation and policy. In 1985, GOI established the Department of Women and Child Development as a part of the Ministry of Human Resource Development. Effective 16 February 2006, the Department has been upgraded to the Ministry of Women and Child Development. Within the Ministry, there are four autonomous organizations: i) National Institute of Public Cooperation and Child Development (NIPCCD); ii) Central Adoption Resource Agency (CARA); iii) Central Social Welfare Board (CSWB); iv) Rashtriya Mahila Kosh (RMK). They have been set up to foster women's empowerment and child development in India. Likewise, two Statutory Commissions: i) National Commission for Women (NCW); and ii) National Commission for Protection of Child Rights (NCPCR), have been established to safeguard the constitutional and legal rights of women and children, redress deprivation of their rights and promote gender justice and equality.³⁰

3. In terms of labor market regulations, India's Equal Remuneration Act 1976 stipulates equal remuneration for same work or work of similar nature without discrimination of gender, caste or any other categories. The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 provides protection against Sexual Harassment and Abuse (SEA) of women at workplace and for the prevention and redressal of complaints of sexual harassment. Furthermore, the Child and Adolescent Labor (Prohibition and Regulation) Act, 1986 prohibits the engagement of children in any occupations as well as prohibits the engagement of adolescents in hazardous occupations. The Maternity Benefit (Amendment) Act 2017 raised the maternity leave from 12 weeks to 26 weeks—one of the highest in the world. However, the law is applicable to only those who work in a company with at least 10 employees.

²⁶ United Nations Development Programme; Human Development Report 2020; http://hdr.undp.org/sites/default/files/hdr2020_technical_notes.pdf

²⁷ A statistical measure to calculate economic inequality in a nation.

²⁸ World Economic Forum (2021); Global Gender Gap Report 2021: Insight Report, March 2021

²⁹ Optional Protocol is a separate treaty open to ratifications by States who are party to CEDAW Convention. OP-CEDAW creates access to justice for women at the international level, if justice is denied at the national level.

³⁰ https://sustainabledevelopment.un.org/content/documents/13091India_review_Beijing20.pdf

4. The National Family Health Survey-5 (NHFS) (2019-2021) demonstrates that women's participation in the formal economy is poor—among the surveyed women, only 25.4 percent worked in the last 12 months and were paid for their labor. In terms of women's political representation, only 14.4 percent of seats in parliament were held by women in 2021. GBV is another major policy reform area with almost one-third of the women in India between the age of 18-49 stated experiencing GBV (NHFS, 2021). Though mobility is the fulcrum connecting women to economic independence³¹, studies suggest that various gender norms, stereotypes and discrimination pose mobility challenges to women, resulting in lack of access to employment, market, health care and other facilities. Sexual harassment is another major barrier that women and girls face in safe access to transport services—in a 2019 survey of almost 10,000 women and girls in India, only less than 10 percent felt completely safe on public transport.³² The survey shows that women face high levels of sexual harassment while waiting for or using public transport.

5. In Haryana, nearly two-thirds (65 percent) of the households are in rural areas with 13 percent of the population living in female-headed households. As compared to the other Indian states, the female participation in formal employment is very low—77 percent of women are not employed as compared to twenty seven percent of men aged 15-49.³³ In terms of GBV, twenty percent of ever married women aged 18-49 in Haryana have experienced physical or sexual violence. However, more than three-quarters (79 percent) of women who ever experienced GBV/SEA never sought help and reported/ shared the incident with anyone. Moreover, a socio-economic survey conducted for the HARC revealed that, among the 9,885 project-affected households, 55.4 percent are male and 44.6 percent are female with a sex ratio of 806 females per 1000 males, much less than the State figure (879), implying strong preference for sons and resulting gender-biased sex selection. Likewise, in almost all the surveyed households, decisions are made mostly by male members of the household. For example, 68 percent of the land and property decisions are made by male members of the household.

6. Achieving gender equality and empowering women and girls is one of the 17 sustainable development goals (SDG 5) and foundational drivers of inclusive and sustainable development. In India, 83.3 percent of legal frameworks that promote, enforce and monitor gender equality under the SDG indicator, with a focus on violence against women, are in place (UN Women, 2021). However, only 44.3 percent of indicators needed to monitor the SDGs from a gender perspective are available, with data gaps in key areas such as unpaid care and domestic work and key labour market indicators (e.g., gender pay gap).

7. AIIB is committed to enhancing its contribution to gender equality by “increasingly incorporating gender considerations into projects, which can be mapped against SDG 5”.³⁴ The updated Environmental and Social Framework (ESF) has elevated the importance of gender equality and included new commitments to address gender-based-violence, amongst others.

³¹ <https://sutp.org/publications/approaches-for-gender-responsive-urban-mobility-gender-and-urban-transport-smart-and-affordable/>

³² <https://safetipin.com/report/safety-audit-of-8-cities-safety-audit-reports-of-8-cities/>

³⁴ https://www.aiib.org/en/policies-strategies/strategies/.content/index/_download/AIIB-Corporate-Strategy.pdf

8. As part of the environmental and social impact assessment for the HORC program, the program conducted 20 inclusive and participatory consultations in five districts with women and vulnerable groups. Access to trainings and improved connectivity to public facilities such as hospitals and schools were some of the key recommendations from the consultations with women groups. The socio-economic survey conducted by the program included 40 percent female respondents while including 50 percent female investigators as part of the research team. The consultation sessions and socio-economic surveys serve as inputs into the creation of the GAP for the HORC program.

9. The GAP identified five areas where gender-specific issues are identified and addressed: (i) in the design of the program, (ii) in the construction of all the infrastructure components of the program; (iii) in the operation of the services supported by the program; (iv) in the stakeholder engagement and consultation process carried out for the development of the design and for the definition of impact mitigation measures to be applied to the program; and (v) in the strengthening of the institutional capacity of the HRIDC to integrate gender and inclusion dimensions in the planning and implementing of railway projects.

10. For the introduction of gender-specific and more broadly, socially inclusive designs, the program will promote gender/vulnerably group-friendly, equitable and accessible infrastructure. It will incorporate IR guideline of Minimum Essential Amenities (MEA)³⁵ in stations. The Indian Railway Guideline 2018 include, for examples: separate compartments in train for female passengers; installation of CCTV cameras at stations (full coverage end to end on both platform); operational railway helpline number 139 over the entire network of IR; lift in station buildings; parking lot for two vehicles used by PWDs; hand railings to staircases; provision of signage of appropriate visibilities; PWDs friendly toilet at stations. The concessionaire agreement between HORCL and MoR also highlights accessibility features. The agreement notes that HORCL has to procure “a barrier-free environment for the physically and visually challenged and for elderly persons using the Rail System” to conform with Ministry of Social Justice and Empowerment guidelines. In addition to the IR guideline, the program will ensure that women helpline number will be displayed in at least 3 places in the stations to address any GBV/SEA related concerns. To ensure last mile connectivity for passengers, the HORC stations will also have suitable road connectivity with the existing road networks including with other modes of transportation such as buses, taxis and autorickshaw from the HORC stations. The program can leverage the existing transport networks and intensify coordination and collaboration with respective government agencies to strengthen the last mile connectivity, particularly for women and other vulnerable groups.³⁶ This is being planned and will be executed by the local State Government authorities.

³⁵ The HORC stations are categorized as non-suburban stations and fall under the NSG-6 category. This category indicates earnings (in Rs.) of up to 1 crore and outward passengers handled is up to 1 million. MEA will be provided as per the NSG-6 category. For more information, see: https://indianrailways.gov.in/railwayboard/uploads/codesmanual/IRWM/worksmmanualCh4_data.htm

³⁶ To ensure safety and security of female passengers, HORC can incorporate examples from other projects. For example, the Gurugram Metropolitan City Bus Limited has initiated a women special bus service that only carries female commuters and includes women bus conductors connecting the city center, metro stations and Gurgaon Railway Station. In the neighboring Delhi, one million construction workers will receive free bus passes for travel in Delhi Transport Corporation (DTC) and cluster buses—there are approximately 3,700 DTC buses and 1,800 buses under the cluster scheme of Delhi Integrated Multi-Modal Transit System. Previously, the Delhi government had launched free travel on public transport buses for women, which was later extended to cover senior citizens.

11. For the introduction of gender-specific actions applicable to the construction stage of the program, the program envisages to address GBV/SEA concerns by developing and implementing a GBV/SEA code of conduct in the ESHS manual. Moreover, an Internal Complaints Committee (ICC) will be set up to address grievances related to SEA at workplace. The program also envisages GRM comprising of at least a woman representative. Ensuring safe and enabling working conditions for female workers will also be part of the contractual agreement with the contractors, such as through establishing separate accommodation, toilets, CCTV surveillance and adequate lighting. In order to promote gender sensitization, capacity building trainings and orientations will be organized for contractors, construction workers and local communities covering issues related to GBV/SEA, sexually transmitted infections including HIV, and human trafficking. Specifically, 2 orientations per contract package will be delivered annually to civil works employees. A short video covering the gender and inclusion aspects will also be developed and disseminated by HRIDC at regular intervals to civil work employees and project staff. One awareness raising program per contract package will also be delivered to the local communities. Further, at least three IEC materials (i.e., zero tolerance to sexual harassment, code of conduct, women hotline) will be developed and disseminated at HRIDC, GC and construction sites.

12. Upon completion of the civil works, a survey will be conducted during the first year of the operations stage to gauge the satisfaction level of vulnerable groups, including women passengers, on station facilities and services. This will guide the HORC in terms of enhancing its services for women passengers.

13. For stakeholder engagement, public consultations, and other outreach activities that have been developed during the preparation of the SIA and RP, these enabled the analysis of potential impacts of the program on women and other vulnerable groups and recommended actions to mitigate the adverse impacts related to loss of livelihoods and income because of loss of agricultural land and businesses, and to increasing safety and GBV/SEA related concerns. The entitlement matrix included in the RP outlines the entitlements to be received by various categories of project affected people including women and vulnerable groups irrespective of ownership status. Along with providing support to mitigate adverse impacts, the RP also includes a livelihood restoration strategy outlining long term mitigation measures including skills training, access public schemes, encouraging the participation of women and vulnerable groups in the program's labor force throughout the project cycle. The skills training will be preceded by consultation, training needs assessment and skill mapping to ensure focused training is provided to these groups. The program plans to continuously engage and consult with the various categories of stakeholders over the course of the program implementation period.

14. For the strengthening of the institutional capacity of the HRIDC to integrate gender and inclusion dimensions in the planning and implementing of railway projects, environmental and social training sessions on ESMP, including on gender issues, will be delivered by AIIB staff for HRIDC, GC and contractors. Also, at least one gender specialist within the GC team and a gender focal point in HRIDC will be hired/appointed to conduct the trainings and ensure the implementation of the GAP. The program will also focus on collating, analyzing and monitoring sex and age disaggregated data to enable the evaluation of gender outcomes of the program. HRIDC will also promote workforce diversity and gender balance in the workplace by revisiting its HR policy and implementing Gender Equality at Work Policy, including Policy on Prevention of

Sexual Harassment and Abuse at Workplace. Training modules (on topics such as GBV, gender and transport, last mile connectivity, gender-responsive programming/budgeting) and annual trainings will also be developed and conducted for HRIDC/GC senior management and staff.

Annex 6: Member and Sector Context

A. Country and State context

1. Bridging the infrastructure gap is vital for India to achieve rapid and inclusive growth in a sustainable manner. According to Global Infrastructure Outlook, India needs USD 4.5 trillion investment in infrastructure between 2015 and 2040. The transport sector accounts for nearly USD 1 billion of investment with the railways requiring USD 395 billion.³⁷ The Strategy for New India @75 by NITI Aayog, outlines government's objective to (a) make available 24x7 power to all by 2019, (b) achieve 175 GW of renewable energy generation capacity by 2022, (c) reduce imports of oil and gas by 10 per cent by 2022-23 and (d) continue to reduce emission intensity of GDP to help India achieve the NDC target of 2030.³⁸ Similarly, the Report of the Task Force on National Infrastructure Pipeline has projected total infrastructure investment of about USD 2.0 trillion over the period 2020 to 2025 for India to become a USD 5 trillion economy. About USD 610 billion investment is envisaged in railway infrastructure, with another USD 40 billion and USD 36 billion, targeted for railway terminal infrastructure and railway rolling stock.³⁹

2. Haryana is the third richest state in India with a per capita income of USD 3700 in FY2020. Its economy grew by a healthy average annual rate of 8.3 percent between FY2011 and FY2019. Growth was primarily led by the services sector, which grew by 10.7 percent over this period and currently accounts for more than half of Haryana's economy. The manufacturing sector also exhibited robust growth, growing by 9.5 percent over this period, which was well above the national average. Strong growth helped alleviate Haryana's poverty rate in 2015-16 being around half of the national average.⁴⁰

3. Haryana seeks to become one of the most developed states of India by 2030 through an integrated approach towards development.⁴¹ For this it seeks to (a) ensure economic growth is accompanied by commensurate employment growth, (b) improve access to education, (c) improve access to basic services for general population and (d) enhance state capacity. Infrastructure will play a vital role in achieving most of these goals. At the same time, Haryana faces the challenge of more evenly spreading growth across the states. Currently, urban areas like Gurugram, Faridabad, Palwal, Bahadurgarh, Panipat, Sonapat and Karnal account for majority of the non-agricultural growth. Spreading growth to other areas will require significant improvement in physical and digital connectivity. Public transport, including mass rapid transit system, is critical for this growth ambition. The government plans to improve both road and rail connectivity across the state. It also seeks to improve connectivity with the Dedicated Freight Corridor from Delhi to Mumbai.

B. Sector and Institutional Context

³⁷ Global Infrastructure Outlook, Oxford Economics and Global Infrastructure Hub, 2017

³⁸ Strategy for New India @75, NITI Aayog, 2018

³⁹ Economic Survey 2019-2020, Ministry of Finance, Government of India

⁴⁰ India, National Multidimensional Poverty Index, Baseline Report, NITI Aayog

⁴¹ Government of Haryana, Vision 2030

4. Indian Railways is the sole operator in the country, operating nearly 68 thousand route-kilometers and employing approximately 1.25 million staff, making it one of the largest employers in the world. The railway maintains a fleet of over 12,000 locomotives, 76,500 passenger coaches, and nearly 300,000 freight wagons. Indian Railways have set a target to electrify 100% of the network by 2024 (currently 66% of the routes are electrified) and to become carbon-neutral by 2030.⁴² Indian Railways expects all new railway projects should be electrified.
5. The railway network in the State of Haryana is approximately 1700 route-kilometers long, fully electrified with most lines operating above 90% of theoretical capacity. It primarily serves freight and intercity passenger services. The State is home to numerous industrial parks and container depots, including 14 that are located immediately within the program catchment area. Specific sidings, serving industrial clients and power plants are also present within the program catchment area, serving multiple high-volume customers.
6. The Haryana Orbital Rail Corridor is one of four programs that the State of Haryana is working to implement with the aim of increasing rail capacity throughout the State. Feasibility assessments for other programs are also being conducted.
7. The Ministry of Railways has identified seven HDNs within IR, all of which have reached or exceeded capacity. Despite comprising only 18% of the route kilometers in the Indian Railways network, these HDN lines carry over 70% of the network's passenger and freight traffic. Of the seven routes, four originate/terminate in the NCR. At the same time, the area surrounding the NCR within Haryana state has seen a large increase in population, employment, and industrial activity. Given the expanding passenger traffic, congestion issues on most rail lines in and out of Delhi, and an interest to increase the use of rail in freight (vs. road and other modes), Indian Railways are looking for ways to increase rail capacity by optimizing operations and increasing the amount of trackage in partnership with the State of Haryana and the Ministry of Railways.
8. Four out of the five broad gauge mainline railway lines that converge in the NCR pass through the State of Haryana. Like the rest of the railway network, these lines use Indian broad gauge (1,676 mm). Traffic that is not destined for the NCR must still pass through the NCR area, utilizing capacity on saturated lines that could be used for local or locally destined traffic. Most of the lines into and out of the NCR have above 80 percent saturation, with some operating above 100 percent traffic saturation.⁴³
9. The Haryana Orbital Rail Corridor is expected to connect with the DFC, part of a larger Dedicated Freight Corridor project aiming to connect major hinterland industrial centers with coastal areas and ports, due to begin operations by 2022, totaling over 2,800 route-kms. Indian

⁴² Source: "Mission 100% Electrification. Moving towards net Zero Carbon Emission." Ministry of Railways, Government of India, February 2021

https://indianrailways.gov.in/railwayboard/uploads/directorate/secretary_branches/IR_Reforms/Mission%20100%25%20Railway%20Electrification%20-%20Moving%20towards%20Net%20Zero%20Carbon%20Emission.pdf

⁴³ <http://horcl.co.in/pdf/dprhorc.pdf>

Railways has issued a plan calling for some future sections to be implemented as a Public Private Partnership (PPP).⁴⁴

10. The Ministry of Railways has been working on railway reforms to encourage the use of rail in freight services, including the policy on the Implementation of the Private Freight Terminal (PFT) which enabled the development of privately-run terminals. Currently, 67 private terminals are operating, and an additional 50 are being planned throughout the country. Investment in private rolling stock (wagons) is also possible under multiple policies, such as the General-Purpose Wagon Investment Scheme (GPWIS) and Liberalized Wagon Investment Scheme (LWIS). Train operation (traction) is done using IR locomotives. Additional recent reforms include liberalizing the usage of private sidings, allowing passenger trains to transport private non-railway parcels, digital improvements in logistics services, etc.⁴⁵

11. **Institutional Context.** IR is overseen by the MoR. Operations are divided into 18 operating zones. Three of these operating zones are present in the NCR: North-Western Railway zone, Northern Railway zone and North Central Railway zone. Additionally, Indian Railways maintains several divisions, which are responsible for production and repair of locomotives and coaches/wagons as well as construction and electrification of the railways. The Board of Directors of Indian Railways provides oversight for multiple independent bodies, corporations, and authorities as diverse as the Dedicated Freight Corridor Corporation of India (DFCCIL), RITES – the consultancy arm of Indian Railways, RailTel Corporation – a telecoms provider, and the HORCL – the SPV responsible for implementing the HORC. A National Academy of Indian Railways provides training and education to current and future railways employees. While rail expansion projects have been delivered using various modalities (PPP, conventional procurement, etc.), IR remains the sole operator in the country. To date no concrete decision has been made on permitting private rail operations.

12. The HRIDC is a joint venture between the MoR and the Government of Haryana. Its aim is to identify rail infrastructure projects in the State of Haryana and act as a central agency for project development and implementation in the rail infrastructure sector. This JV is, in turn, a shareholder of the HORCL – an SPV tasked with implementing the HORC.

⁴⁴ “Turnaround in execution of Dedicated Freight Corridor Project”, Ministry of Railways, Government of India, February 2021

https://indianrailways.gov.in/railwayboard/uploads/directorate/secretary_branches/IR_Reforms/Turn%20around%20in%20execution%20of%20Dedicated%20Freight%20Corridor%20project.pdf

⁴⁵ Source: Freight Reforms in Indian Railways, Ministry of Railways, Government of India, January 2021

https://indianrailways.gov.in/railwayboard/uploads/directorate/secretary_branches/IR_Reforms/Freight%20Reforms%20in%20Indian%20Railways.pdf

Annex 7: Sovereign Credit Fact Sheet

A. Recent Economic Development

1. India is a lower-middle-income country, with a GDP per capita at USD 1927.7 and a population of 1.38 billion in 2020.⁴⁶ India's economy grew at an average annual rate of 7.4 percent between FY2014 and FY2018 but has slowed down in the years before the pandemic following disruptions due to demonetization, rollout of goods and services tax, rural distress and stress in the financial sector.⁴⁷ The economy contracted by 6.6 percent in FY2020 as a result of the COVID-19 pandemic and resulting lockdown.⁴⁹ It showed signs of revival in the last two quarters of FY2020 as the lockdown measures were gradually eased. Government's initial estimates indicate that the economy grew by 8.7 percent in FY2021.

2. Inflation averaged 6.2 percent in FY2020, primarily driven by food inflation due to supply side disruptions. As a response to the pandemic, the Reserve Bank of India (RBI) reduced the repo and reverse repo rates by 115 and 155 basis points to 4.0 and 3.35 percent respectively in May 2020 and introduced measures to reduce the borrowing cost, bolster liquidity, and improve credit flow to the productive sectors. Policy rates remained unchanged with the RBI maintaining an accommodative stance between August 2020 and April 2022. Inflation moderated slightly to average 5.5 percent in FY2021 due to decline in food inflation even as core inflation remained sticky. With inflation rising since the last quarter of FY2021, the RBI raised the repo rate by a cumulative 90 basis points since March 2022. It has indicated a withdrawal of the accommodative stance so that inflation comes down to the target band of 4-6 percent. Between April and June 2022, inflation averaged 7.4 percent due to elevated food and fuel prices. The Indian rupee depreciated by around 3 percent between April and June 2022. This recent depreciation is mainly attributed to the capital outflows as a response to monetary tightening in advanced economies.

3. General government fiscal deficit is estimated to have risen to 12.8 percent of GDP in FY2020. A downturn in revenue due to economic slowdown and higher spending on the stimulus package resulted in the deficit widening significantly. Central government fiscal deficit declined sharply to 6.7 percent of GDP in FY2021 compared to 9.2 percent in FY2020. Revenue collection grew at 32 percent in FY2021, at a pace higher than expected pace due to buoyant tax revenues. This allowed capital expenditure to increase by 39.3 percent in FY2021, well above the initial target of 30 percent. High fiscal deficit in FY2020 and FY2021 resulted in the public debt rising to close to 90 percent of GDP but is expected to remain stable in the medium term.

⁴⁶ The income group classification for fiscal year 2019 is based on World Bank criteria.

⁴⁷ Data are based on fiscal years. Fiscal year 2020 (FY2020) begins on 1 April 2020 and ends on 31 March 2021.

⁴⁸ 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.

⁴⁹ On March 24, the government announced a nationwide lockdown till April 14, subsequently extended to May 30. Lockdown was eased beginning June 1.

4. The current account posted a surplus in FY2020, for the first time since 2002, due to a greater decline in imports as compared to exports. The current account reverted to a deficit of 1.6 percent of GDP in FY2021 as merchandise imports surged while services exports remained stagnant. Private transfer, including remittances, remained strong with net inflow of USD 81.2 billion in FY2021, as global economic prospects improved. Net FDI inflows remained robust at USD 38.5 billion. External debt stood at USD 633.5 billion or 21.8 percent of GDP in March 2022. India's reserve holdings declined by USD 35 billion as the central bank aimed to reduce currency volatility. Reserves continue to remain adequate according to conventional measures.

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

B. Economic Indicators

Selected Macroeconomic Indicators (2019-2023)

Economic Indicators	FY2019	FY2020	FY2021*	FY2022*	FY2023
Real GDP growth	3.7	-6.6	8.7	7.4	6.1
CPI Inflation (average, % change)	4.8	6.2	5.5	6.1	4.8
Current account balance (% of GDP)	-0.9	0.9	-1.6	-2.9	-2.5
General government overall balance (% of GDP)	-7.5	-12.8	-10.4	-9.9	-9.1
General government gross debt (% of GDP)	75.1	90.1	86.8	86.9	86.6
Public gross financing needs (% of GDP)	11.6	17.2	16.5	15.2	14.4
External debt (% of GDP)	19.5	21.4	21.8	21.7	
Gross international reserves (USD billions) 1/	475.6	579.3	617.6	572.7	
Exchange rate (INR/USD, EOP) 1/	75.4	73.5	75.8	79.9	

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

* denotes projected figures

1/Reserves and exchange rate for FY2022 are sourced from RBI and pertain to mid-July 2022.

Source: IMF World Economic Outlook April 2022, January 2022, Reserve Bank of India, and IMF Country Report 21/230.

C. Economic Outlook and Risks

6. The economy is expected to grow at 7.4 percent and 6.1 percent in FY2022 and FY2023, respectively, according to IMF. The severity of the COVID-19 pandemic is expected to subside with a pickup in vaccination rate. However, the war in Ukraine contributing to the rise in high commodity prices and monetary tightening in some of the advanced economies would curb demand. Public investment is expected to play an important role with the Prime Minister's Gati Shakti initiative fostering integrated planning and coordination of infrastructure connectivity projects. Private investment is expected to get a push from bank deleveraging and improvement in logistics. With disruptions to mobility easing, some of the pent-up demand will lead to a boost in private consumption. Supportive policies like the production-linked scheme and rise in tariffs could facilitate the domestic manufacturing sector. However, if high tariff rates become a long-standing feature, it is likely to hamper domestic competitiveness and integration into GVCs.

7. Overall inflation is expected to remain elevated at around 6 percent in FY2022 and moderate to around 5.0 percent from FY2023 onwards due to easing of commodity prices. In May 2022, the RBI indicated withdrawal of its accommodative stance in response to sustained inflation. Rising inflation and tightening in the federal funds rate may push the RBI to further raise interest rates.
8. General government fiscal deficit in FY2022 is expected to moderate to 9.9 percent of GDP as tax revenues increase on the back of improved economic activity. However, the pace of fiscal consolidation will be slower than originally outlined in the Fiscal Responsibility and Budget Management Review Committee.
9. Public debt, which rose sharply to 90.1 percent of GDP in FY2020, levels last witnessed in early 2000s, is expected moderate to 87 percent of GDP in FY2021 and remain stable in the medium term. Despite being high, India's public debt remains sustainable given favorable debt dynamics and the projected 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.
10. The current account deficit is projected at 2.9 percent of GDP for FY2022 as import growth is expected to outpace export growth. Increase in oil prices is expected to exacerbate the trade deficit. Remittances are also expected to pick up as Middle East economies recover and the spread of the COVID-19 pandemic in advanced economies is contained.