

## Ex-Ante Evaluation (for Japanese ODA Loan)

South Asia Division 1, South Asia Department, JICA

### 1. Basic Information

Country: India

Project Name: Project for Construction of Mumbai-Ahmedabad High Speed Rail (II)

Loan Agreement : October 29, 2018

### 2. Background and Necessity of the Project

#### (1) Current State and Issues of the Railway Sector in India

The population in India was 844 million in 1991 whereas it reached 1,002.9 million in 2001, exceeded 1,210 million in 2011, and it is anticipated to increase continuously (Source: National Census in India in 2011). Adding to this population increase, domestic passengers and freight transport volume have been increasing sharply along with recent rapid economic growth at a rate of more than 7% per annum. Moreover, the passenger transportation volume in 2016 reached about 1.7 times that of 2000 and the freight transport volume has reached about 2.3 times (Source: Ministry of Railways (MoR) of India “Indian Railways Year Book 2015-2016”). In addition to the fact that current railway capacity has been only about 50% of the expected demand for passenger/freight transport on the national average of 2032, the frequent occurrence of train delays is also an obstacle to the smooth movement of people. Today, it has a structure in which about 85% of the means of transport connecting Mumbai, the capital city of Maharashtra State and the second largest city in the country, and Ahmedabad in Gujarat State, which is rapidly developing as a commercial and industrial city in recent years, consists of private vehicles and buses. These two states are growing with momentum that exceeds the overall economic growth rate of India, and it is predicted that they will continue to have stable growth beyond the next 30 years (Source: National Planning Commission in India). On the other hand, in India, households with higher incomes tend to rely on means that enables travel in a shorter time over longer distances, such as airplanes. However, since the only the aviation sector alone cannot catch up with the increase in the transportation demand, high-speed rail with both mass and high-frequency transportability is expected to play a major role. According to the demand forecast survey regarding the Project for Construction of Mumbai-Ahmedabad High Speed Rail (hereinafter referred to as “the Project”) conducted under the “Joint Feasibility Study for Mumbai-Ahmedabad High Speed Railway Corridor,” it is estimated that the passenger demand at Ahmedabad Station and Mumbai Station at the time of opening (in 2023) will be about 21,000 people/day and about 30,000 people/day respectively, and these numbers are expected to increase about 5 times more than these figures in 2053.

In December 2009, the Ministry of Railways (MoR) of India formulated “Indian Railways: Vision 2020” and set forth the development of the priority train tracks on high-speed rail including the Mumbai-Ahmedabad section, in addition to modernization of conventional lines and enhancement of transport capacity. In Japan-India Joint Statement in December 2015, the two governments agreed that the Mumbai-Ahmedabad section shall be developed with the implementation of Japanese high speed rail technologies and experience. Then,

in this regard, detailed consultations shall be held so that financial and technical assistance will be provided by Japan.

The Project is positioned as a priority project within the railway sector of India, and it aims to realize efficient passenger transport by enhancing the passenger transport capacity through construction of train tracks, development of a signal/communication system, and the introduction of high-speed rail cars. The Project aims to realize efficient passenger transport by enhancing the passenger transport capacity through construction of train tracks, development of a signal/communication system, and the introduction of high-speed rail cars, and is positioned as a priority project in the railway sector in India.

(2) Japan's and JICA's Cooperation Policies for the Railway Sector and the Priority of this Project

Japan's Country Assistance Policy for India (March 2016) states that infrastructures, such as transportation and power, which are the hub of the transportation and network, shall be developed in order to reinforce the connectivity within and among the major industrial cities/economic zones in India, with the aim of resolving the infrastructure bottleneck against investment and growth. In addition, in order to eliminate the bottleneck in economic growth, JICA Country Analysis Paper for India (March 2018) provides that particularly in the industrial agglomeration areas such as special economic zones and economic corridors located in the six major metropolitan areas in India as well as in the Delhi–Mumbai Industrial Corridor that are expected to receive big impacts by the support of JICA, it is necessary to provide support for regional economic development facilitation, logistics optimization, and infrastructure development including arterial railroad (including high-speed rail and cargo transport), urban railway, roads, and harbors, which contribute to increased investment from foreign capital. Accordingly, this project is consistent with these policies and analysis. When the first phase of E/N related to the Project (100,000 million yen) was concluded in September 2017, an ODA loan was concurrently granted to the Project for the Construction of Training Institute for Mumbai-Ahmedabad High-speed Rail for training personnel required for opening the high-speed rail. For the transportation sector, there were 61 ODA loan approval cases totaling 2,239.8 billion yen as of the end of September 2018, including 38 ODA loan approval cases totaling 1,762.1 billion yen as of the end of September 2018 to the railway sector to provide support for subway projects such as Delhi Metro, etc. In addition, the plan/basic design of the Project is formulated under the “Joint Feasibility Study for Mumbai-Ahmedabad High Speed Railway Corridor.”

(3) Other Donors' Activity

The World Bank supports the development of roads and suburban railways in Mumbai (JICA is involved in urban railways) and the development of the East Corridor (JICA is involved in the West Corridor) under the Dedicated Freight Corridor Project. The Asian Development Bank (ADB) is providing institutional and other assistance to India's railway sector, especially for organizational reforms of Indian Railways. Both of them provide mutually complementary support with JICA.

### 3. Project Description

(1) Project Objective

The Project aims to establish a high-frequency mass passenger transport system by using the Japanese bullet train system and constructing high-speed rail in

about 500 km of a section between Mumbai in Maharashtra State and Ahmedabad in Gujarat State, thereby contributing to the reduction of traffic pollution, reinforced connectivity, and wide economic development of the target areas.

- (2) Project Site/Target Area  
Gujarat State, Maharashtra State, Dadra and Nagar Haveli
- (3) Project Components
  - a) Civil Engineering/Construction Work [Mumbai Station, Undersea tunnel, General civil engineering sites (viaducts, stations, etc.), Bridges]
  - b) Civil Engineering/Construction Work (vicinity of Vadodara Station, vicinity of Ahmedabad Station and Sabarmati Station) [CM/GC (Construction Manager/General Contractor) system]
  - c) Railroad Track Construction
  - d) Electrical/Mechanical Work
  - e) Depot
  - f) Rolling Stocks/Track Inspection Vehicles
  - g) Track Maintenance Equipment
  - h) Consulting Services (construction supervision, quality control, safety management, technology transfer to improve executing agency's capacity to supervise construction, etc.)
- (4) Estimated Project Cost  
1,806,282 million yen (Feasibility Study basis. Total project cost and the amount of ODA Loan will be determined through detailed designs, etc. which will be conducted in the future.)
- (5) Schedule  
September 2018 – December 2025 (88 months in total, based on the premise of the completion date confirmed by the intergovernmental consultations between Japan and India by the present moment). This project will be completed when all the facilities are put into service (December 2023).
- (6) Project Implementation Structure
  - 1) Borrower: President of India
  - 2) Guarantor: None
  - 3) Executing Agency: National High Speed Rail Corporation Limited (hereinafter referred to as "NHSRCL")
  - 4) Operation/Maintenance Agency: NHSRCL will conduct the maintenance and management of the facilities and the human resource development training after the project completion. For this reason, with the consideration of operation and maintenance after the completion, construction supervision consultants with abundant knowledge of the construction/operation and maintenance of the bullet train in Japan are hired through an ODA loan at the fund procurement/construction stages, and technology transfer to the NHSRCL staff is performed. Moreover, another training program by granting an ODA loan and utilizing training facilities under construction is planned to be conducted, and experts are to be dispatched from Japan to provide support for implementation of the training. In addition, in order to safely and promptly implement the Project which is also specified in the national plan, a sufficient budget for operation and maintenance expenses will be allocated from the central government ministries.

(7) Collaboration and Division of Roles with Other Projects and Donors

1) Japan's Assistance Activities

In association with the Project, the following paid account technical assistance has been implemented.

| Name of JICA Project   | Period                     | Relationship with the Project  |
|--|----------------------------|--|
| Joint Feasibility Study for Mumbai-Ahmedabad High Speed Railway Corridor (hereinafter referred to as "F/S Survey")]        | December 2013 – June 2015  | <ul style="list-style-type: none"> <li>• Preparatory Survey of the Project (F/S Survey)</li> </ul>   |
| The Follow-up Study for Mumbai-Ahmedabad High Speed Railway Corridor   | March 2016 – February 2018 | <ul style="list-style-type: none"> <li>• Support for the institutionalization of a legal system, technical standards, security assurance, and the development of stations/around stations</li> <li>• Promoting understanding of a high-speed rail project through training in Japan for NHRCL executives</li> </ul>  |
| The Detailed Design Study of the Mumbai - Ahmedabad High Speed Railway Project   | December 2016 – March 2020 | <ul style="list-style-type: none"> <li>• Detailed design study of the Project (D/D).</li> <li>• Basic design, detailed design, creation of tender documents and bidding support regarding the Project well as a high-speed rail training facility project</li> <li>• Developing various regulations related to construction/operation/maintenance of the high-speed rail project and drafting a training plan for training lecturers.</li> </ul> |
| Capacity development support pertaining to High-speed Rail Construction Project [Technical Assistance Related to ODA Loan] | August 2017 – March 2019   | Technical assistance by Japan Railway Company to an executing agency by making good use of experiences as a bullet train operator in Japan   |
| Organizational Reinforcement Advisors for NHRCL  | June 2018 – May 2020       | Support through advice on developing the organizational capacity of NHRCL by dispatching Japanese experts  |
| CM/GC Pre-construction Service   | May 2018 – May 2020        | Along with the adoption of CM/GC system, by obtaining the participation of contractors at the designing stage, it is aimed to improve the quality of the construction design plan created based on the Detailed Design Study and to  |

|  |                           |  |
|--|---------------------------|--|
|  |                           | minimize the revision of the plan at the construction implementation stage.  |
| Ministry of Railways/NHSRCL officials training | Fiscal 2018 – Fiscal 2019 | To conduct training in Japan to acquire knowledge such as policies, technologies, and systems of railway business focusing on bullet trains in Japan |

2) Other Development Partners' Assistance Activities:  
None in particular

(8) Environmental and Social Consideration/Poverty Reduction/Social Development

1) Environmental and Social Consideration

(i) Category: A

(ii) Reason for Categorization: This project falls into the railway sector and has influential characteristics, both being shown in the JICA Guidelines for Environmental and Social Considerations (proclaimed in April 2010).

(iii) Environmental Permit

Although preparation of an Environmental Impact Assessment (EIA) Report is not required under the domestic law in India, it was prepared by the NHSRCL in July 2015, and an updated version reflecting the subsequent change in the project plan, etc. was prepared in August 2018.

(iv) Anti-Pollution Measures

During construction, air pollution and water pollution concomitant with drilling and construction machine operation are handled by watering, the use of dustproof sheets, wastewater treatment plants, etc. Regarding the waste, excavated soil generated by the tunnel construction is reused in the section for the embankment, etc., and the rest of the soil is properly disposed of at designated disposal sites. In the section of tunnel construction, the ground is solid and implementation of appropriate construction methods is planned to prevent loose ground and the inflow of groundwater; therefore, a serious impact due to ground subsidence is not expected. Regarding noise and vibration concomitant with the blasting work, operation time will be limited to minimize the impact on neighborhoods. With respect to noise, vibration, etc. due to running cars when in operation, countermeasures such as the installation of soundproof walls are taken to minimize the impact. Regarding the noise/vibration of the tunnel portion and the elevated portion, it is aimed to be reduced by the maintenance of the railroad track on a regular basis and compliance with the speed limit.

(v) Natural Environment

The target area of the Project extends through the core zone and the buffer zone of Thane Creek Flamingo Sanctuary, the buffer zone of Sanjay Gandhi National Park, and the buffer zone of Tungreshwar Wildlife Sanctuary. Disbursement is planned to be made after acquiring clearance on the development in that area. Around the Thane Creek Flamingo Sanctuary, mangrove swamps spread over flamingos inhabit. The impact on flamingos and the surrounding ecosystems will be minimized by setting the railroad track to 30 m of an undersea tunnel section underground. The management plan for the above three districts

will be complied with minimizing the impacts. Furthermore, logging of about 58 ha of forest land and about 19 ha of mangrove forest will be performed in association with the development of the railyard and the railroad track, etc. With respect to felling forests, alternative tree planting is performed by Forest Department in each state.

(vi) Social Environment

The Project involves the land acquisition of 1,022.37 ha and relocation of 1,887 households, and they will be proceeded according to the Resettlement Action Plan based on the domestic laws in India and JICA guidelines. Affected citizens were given an explanation of the project outline, environmental and social consideration policy, compensation policy, etc. through census survey based on individual visits and residents' consultations. According to the minutes of the residents' consultations, no dissenting voice on the project has been confirmed in particular. In addition, an indigenous peoples' plan was created for designated tribes residing in target areas, in accordance with the domestic laws in India and JICA guidelines as well as the results of residents' consultations, and then the agreements on the implementation of this project with those tribes have been confirmed.

(vii) Other/Monitoring

During the construction, contractors will monitor the air quality, water quality, noise, vibration, waste, vegetation, ecosystem, etc. under the supervision of the NHSRCL, and after the commencement of the service, NHSRCL will monitor the noise, vibration, vegetation, ecosystem, etc. Also, the NHSRCL will conduct monitoring of resident relocation, land acquisition, and livelihood recovery support measures.

2) Cross-cutting Issues:

The Project aims at a modal shift from automobiles, buses, etc. and contributes to the reduction of greenhouse gas (GHG) emissions. The mitigation effect of the Project on climate change (rough estimate of GHG emission reduction) is about 670,000 tons/year of CO<sub>2</sub> equivalent. Since many workers engaged in the Project are assumed to live without their families, it is considered that the risk of HIV infection is high; therefore, a plan for HIV prevention activities shall be formulated so that the contractors will be obliged to take measures according to the plan.

3) Gender Category: [Gender Project] GI(S) (Gender Activity Integration Project)

<Description of activities and reason for classification>

In the Project, measures will be taken such as the installation of CCTV cameras in station buildings so that women can use the high-speed rail safely and comfortably. Therefore, it is categorized as a Gender Activity Integration Project.

(9) Other Important Issues

In the Project, the government of Japan and the government of India have agreed that the tied loan will be applied to the fund procurement condition in order to utilize the technology and knowledge of Japan and for the development.

#### 4. Targeted Outcomes

(1) Quantitative Effects

Performance Indicators (Operation and Effect Indicator)

| Indicator   | Baseline<br>(Actual value in<br>2018)   | Target (2025)<br>[Expected value<br>2 years after the start of<br>the high-speed rail<br>business] |
|---|---|--|
| 1. Number of Operations<br>(number/day)                           | —   | 70   |
| 2. Passenger Transportation Volume<br>(million passengers-km/day) | —   | 18.04  |
| 3. Travel Distance<br>(thousand km/day)                           | —   | 354.0  |
| 4. Transportation Time (minutes)                                  | —<br>(Approximately 420<br>minutes when<br>using a<br>conventional line<br>express train) | 127  |
| 5. Operating rate (%)   | —   | 87.5   |

(2) Qualitative Effects

Improvement in traffic conditions between Mumbai and Ahmedabad, reduction of traffic pollution, mitigation of climate change, improvement in convenience by ensuring scheduled movement, and economic development of the region.

(3) Internal Rate of Return

Based on the following premise, the economic internal rate of return is about 11.8% and the financial internal rate of return is about 4.0%, both calculated according to the Feasibility Study.

[EIRR]

Cost: Project, operation and maintenance expenses (excluding tax)

Benefits: Fuel saving effect, vehicle operation cost reduction effect, travel time reduction effect, air pollution mitigation effect, accident cost reduction effect, etc.

Project Life: 30 years

[FIRR]

Cost: Project cost, operation and maintenance expenses

Benefits: Fare and non-fare incomes (including advertisement revenue)

Project Life: 30 years

#### 5. Prerequisites / External Factors

(1) Prerequisites

None in particular

(2) External Factors

Aggravation of political and economic situations in India and the surrounding area of the project target, as well as natural disasters

## **6. Lessons Learned from Past Projects**

During implementation of other projects in the railway sector in India, it was observed that agencies other than the executing agency were involved in the designing and approving processes, which is not stipulated in the contract provisions, subsequently leading to prolonged decision by the executing agency and resulting in delays in the project. In addition, in this project, objectives such as “partial commencement of the business operation,” which are not set forth in the contract document, are set by the executing agency, and contractors and consultants pointed out the problem that realistic supervision of the construction process in accordance with the actual situation was not being performed. In the Project, in case of a problem that leads to such a delay in the project as well as a problem that cannot be resolved among contract parties, the steering committee that is established as a place for intergovernmental consultations between Japan and India is utilized. The committee is positioned as a place to solve problems at the preliminary step prior to the Dispute Board (Dispute Adjudication Board) and arbitration, and the basic policy for its establishment was agreed upon by Japanese and Indian government officials at the 5th Japan-India Joint Committee held in June 2017.

## **7. Plan for Future Evaluation**

- (1) Indicators to Be Used  
Same as 4. (1) - (3)
- (2) Timing of the Next Evaluation  
Ex-post evaluation: After the start of the high-speed rail operation (from 2023 onwards)

END.