

Economic and Financial Viability study of Dedicated High Speed Rail Network between Mumbai and Ahmedabad

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Abstract

This research paper analyzes the key issues and feasibility study of the much-publicized and dream project of the Government of India. The project on the bullet train is expected to be completed by August 15, 2022. The profits from this project will decide about the ease or difficulty India might have to pay this loan back. The economic and financial viability will be the yardstick for the Mumbai-Ahmedabad rail corridor project. According to National High-Speed Rail Corporation officials, the long route corridor would not be feasible financially as travelers prefer flights to extended journeys by train.

Keywords: High Speed Rail, Indian Railways, Bullet train, Feasibility, India, Economic, Financial JEL: G H54

Introduction

Indians used to see bullet trains and often used to talk about it but never imagined that the dream of bullet trains will come true soon. The UPA government formed a committee in 2013 to bring high-speed trains in India but did not deliver on any promises. The foundation stone for the Mumbai-Ahmedabad High-Speed Railway Project (MAHSR), was laid in September 2014 by the two Prime ministers Mr. Narendra Modi and Mr. Shinzo Abe. This step was a massive leap towards India and Japan converging and integrating themselves in a long-term sustainable economic relationship. The project will enable Indians to learn the Japanese art of perfection in engineering and execution, and pick up innovative and sustainable practices through the Make in India initiative. The launch also culminates a long process of preparations and negotiations between the two countries. The first firm step towards the implementation of the MAHSR project was the initiation of the detailed feasibility report by JICA and the Ministry of Railways. Work on the feasibility report started in 2013 and concluded in July 2015. However, the formal decision to go ahead with the plan was taken only after a rigorous project appraisal by the Committee on Innovative Collaborations (CoIC). This committee comprised the vice-chairman of NITI Aayog, Chairman of the Railway Board, Secretaries of DIPP and DEA, Former Cabinet Secretary Mr. K. M. Chandrasekhar and Ex-CVC P Shankar. The issues considered in detail included the relevance of high-speed rail for India and why the Japanese proposal was technologically and financially the best. The project could be taken forward as it had a high level of political commitments driven by the prime minister himself who wanted high-speed transportation to reach the masses.

Background

A report issued by an Expert Committee on the modernization of National railways established by the Ministry of Railway, the Republic of India, designates the line between Mumbai and Ahmedabad (approximately 500 km) as the first HSR section to be constructed. A pre-feasibility study for this line by

MITES of India, Systra of France and others done in FY2009. Against this backdrop, India and Japan issued a joint statement on May 29, 2013, that included a decision to conduct a joint study on the construction of the HSR between Mumbai and Ahmedabad. In response, JICA and the Ministry of Railways, the Republic of India signed a Memorandum of Understanding (MOU) for the joint feasibility study on October 7, 2013. JICA conducted a feasibility study concerning the plan to develop the HSR between Mumbai and Ahmedabad based on the MOU mentioned above.

Japanese funding agency JICA has inked a tripartite consultancy pact with Railway Ministry and National High-Speed Rail Corporation for the high-speed railway project between Mumbai and Ahmedabad. JICA promotes the smooth implementation of the Mumbai- Ahmedabad High-Speed Railway Project by signing the Memorandum for General Consultancy. JICA will bear the cost of GC up to 2020 and will contribute to the smooth implementation of the High-Speed Railway Project. The National High-Speed Rail Corporation Ltd (NHSRC) in charge of the implementation of the project is a joint venture between Japan International Consultants for Transportation Co (JIC), Nippon Koei Co and Oriental Consultants Global Co. Ltd. The joint venture is tasked to implement the General Consultancy of the project. The salient features of feasibility report on Mumbai-Ahmedabad high-speed corridor area:

- Entire length of corridor – 508 kilometers.
- 12 stations between Mumbai and Sabarmati (Mumbai, Thane, Virar, Boisar, Vapi, Bilimora, Surat, Bharuch, Vadodara, Anand, Ahmedabad, Sabarmati).
- The total journey time of 2.07 hours for a fast train and of 2.58 hrs for trains stopping at each station.
- Total completion cost estimated at approximately ₹ 97,636 crore (including price escalation, Interest during construction (IDC) and import duties).
- Project implementation time of approximately seven years from commencement of construction.

According to the report, the Internal Rate of Return of the project estimated at 4 percent and Economic Internal Rate of Return as 11.8 percent. The high-speed project marks the beginning of a new era for intercity transportation in India. While the executing agencies are involved in realizing this technologically challenging project, national planners should apply their minds to develop a road map for future HSR projects and other aspects such as safety certifications for such projects and for extending the technology to other parts of the country. The Japanese firm has demonstrated its excellence in the Delhi Metro.



FIGURE 1 TARGET AREA OF MUMBAI AHMEDABAD RAIL CORRIDOR

Present Population of Target Area of Mumbai-Ahmedabad Corridor

The annual average population growth rate in the states of Maharashtra and Gujarat from 2001 to 2011 is 1.5 % and 1.8 %, respectively. The population density per square kilometer of Mumbai city, Mumbai suburban, Thane, Surat, Ahmedabad city is approximately 42,000, 23,000, 10,000, 14,000 and 14,000, respectively. In the Mumbai Metropolitan Region (MMR), the Mumbai City and the Mumbai Suburban south area have high population density. However, the population in the Mumbai city district (old town) has decreased in recent years. On the other hand, the population in Thane district next to the Mumbai and Pune districts has increased sharply.

Literature Review:

Dhruv Sanghvi and Varia (2013), has reviewed the implementation and adoption of light rail as an alternative mass transit system. Light rail is well suitable for a developed country like the US and developing countries like India. The latest upgraded technology in light rail transit, more passenger-carrying capacity, Eco-friendly mode and economic features proves it a mandatory option in the transportation of the Indian era in the present situation. Furthermore, it can reduce the problem of accidents, congestion and fuel consumption. Therefore, the Light Rail Transit System seems to be a better solution for most of the transport and traffic-related issues in India.

Sharma and Anil Kumar (2014) analyzed that India has gained a higher position as far as traveled passengers per km are concerned, but is far behind in the field of the latest technology used by the other countries such as Japan, UK and US. Vision 2020 proposed by the Ministry of Railways, India focuses only on the adoption of mandate technology with high-speed rails, but we still lack behind in the Research and Development of the railway industry.

Ramesh and Joseph Raj (2014) analyzes the fiscal demand of the Indian Railways to modernize the infrastructure of the rail industry. It may include the provision of the automated signaling system to prevent crashes. Rajdhani and Shatabdi trains are the fastest trains running in India. They quote the crucial other problem of Indian Railways is the higher accident rate, which includes derailment, collisions, many being run over by trains.

Shukla and Pathak (2015) conclude that the high-speed rails may perform a crucial role in retaining and regaining the future share of the railway network. They also convey the unpredictable demand between intercity transport, the presence of several high-density corridors and increasing future incomes. High-Speed rails make a comfort platform in intercity transport evolution. The improving concentration on high-speed railways in India reflected in the new policies and budget announced by the Government of India. The analysis highlights the benefits of high-speed rails that can bring in terms of regional development and other benefits, including improving lifestyle and time-saving.

Sharma and Annu (2015) analyzed that India needs to reanalyze its entire railway system before commencing the construction of the high-speed rail network. A comprehensive plan for the upgradation of the existing system is the need of the hour. These may include updating the railway tracks, traction and power systems, rolling stock, signaling and braking systems, passenger safety, passenger information system, cleanliness and maintenance, disaster management and above all time management. A dedicated track segregated from the existing crowded grid with all the new advancements would be the only solution to its structure of Indian railways.

Dutt (2016) explains the scenario of bullet rails by cutting down the journey time across the country in an environmentally friendly way. This project will allow the original potential of young India and it will be a milestone in a step towards emerging progress. Bullet trains would provide a significant boost to Indian Railways with advanced safety, technology transfer, skill development and a huge influx of resources.

Raghuram and Udayakumar (2016) deliberate on the issues in developing a high-speed rail network in India are complex. India is a developing country and the primary concern is whether the funds for such a project could be better utilized in other domains, including in upgrading conventional rail. However, the Japanese funding to the tune of 80% of the project cost may not be available for other uses.

The objective of Study and Research Methodology: The study mainly focuses on an effective analysis of the economic and financial viability of the Bullet train rail corridor between Mumbai and Ahmedabad, which is based on developing smart future cities in India. An attempt is made to present the manuscript in the form of analysis of the secondary source of information and review of existing literature and data available for expected fares and stations between Ahmedabad and Mumbai. It also considers the Cost of Financing a bullet train by sources of Finance.

Analysis of Relevant Data and Information

Mumbai is the financial capital of India and Ahmedabad is one of the most emerging city from a business point of view, which creates a high chance of the success for this bullet train in India. The project is estimated to double its revenue in the next twenty years after its completion. In December 2015, India and Japan signed a Memorandum of Understanding (MoU) to set up a high-speed rail (HSR) network costing INR 976.36 billion, between Mumbai and Ahmedabad. Japan would fund \$12 billion (about INR 781 billion, providing for about 80% of the project cost) offering a concessional loan to India with a repayment period of 50 years including a moratorium of 15 years, at an interest rate of 0.1 percent. This segment for HSR implementation would be based on the Japanese Shinkansen technology. The 508 km Mumbai-Ahmedabad high-speed link will be India's maiden high-speed rail project. It is part of the 650 km Pune-Mumbai-Ahmedabad line, one of the six high-speed corridors identified for implementation in the country.

It is natural that a highly expensive project such as the 508-km, Mumbai-Ahmedabad high-speed rail (HSR) with a price tag of Rs. 1,10,000 crore would elicit doubts about its viability. HSR helps bring settlements 500-km apart within two hours of each other. It not only diverts passengers from air, rail and road, it also generates a new class of passengers. It has been a catalyst for economic development, a stimulant for the development of satellite towns, helping alleviate migration to metropolises. Providing services from and to city centres, it serves important centres in the route, saving time through easy access to tier-2 and tier-3 towns. Thus, giving a boost to tourism, property values and services sector starts to grow in new areas.

Habitually timid and tardy, India always tries to 'catch up' rather than set the benchmark. A nation of India's size, potential and aspirations have to envision its destiny, dream big and bold, sometimes with irrational exuberance. For want of appropriate railway product and its capacity crunch, India's domestic air travel grows 15-20 percent annually. Hawaii Chappalwala now rides hawaii jahaz. As an inspirational project, HSR will help IR build international standards of engineering and services, also project execution with Japanese forte—quality and excellence.

Route plan

The Mumbai–Ahmedabad section is a long line with a total length of 500 km. In view of the distribution of cities on the line. The line would have 11 stations, with an average of 50-km interval

between them. The study reviewed the original proposal on the assumption that the major stations in Mumbai, Ahmedabad, and Vadodara would be set up in the city centers or added to the existing conventional line stations. Mumbai is the financial capital of India and Ahmedabad is one of the most emerging city from a business point of view which creates a high chance of the success for this bullet train in India.

The project provides for Japan to transfer not only Shinkansen rail tech, but it will also train the Indian workforce in sophisticated construction technologies. Through an entire value chain with thousands of suppliers, 'Make in India' will get a major boost. The project is expected to reduce the travel time between Mumbai and Ahmedabad to less than two hours compared to the current journey time of more than seven hours. The HSR corridor has the potential to be an inflection point as Maruti generated from India's automobile industry; it could build a structure essential for the transformation of India's lifeline.

An airport is located in the outskirts of the city. Travelling to an airport takes more than one hour in Delhi and more than 2 hours in Bangalore. Similar is the situation with Ahmedabad and it takes 45 minutes to reach the Ahmedabad airport. It takes at least 50 minutes before boarding to check in. After reaching the destination, it takes minimum 30-40 minutes to move out of airport. As the passenger have to travel from Airport to city, it will take minimum 1 hour. If do the calculation, it took almost 300 minutes for an 80-90 minutes journey (including the journey time).

The railway station will be within the city and the passengers need not to get in hours before entering the station. The distance between Ahmedabad to Mumbai in almost 120 minutes (journey time) + 60 minutes extra time. Even if we include the extra time, still it will save time in travelling through train compared to flight. According to Forbes India, the costs for constructing such rail lines in India are estimated to be Rs. 70-100 crore per km. Therefore the Mumbai-Ahmedabad route of 500 km, will cost around Rs. 45,000 crore to construct. With the cost of land acquisition and other cost, the estimated price of the project would be around Rs.80,000 crore. To make a profit, passengers will have to be charged Rs. 6 to 9 per km. Ahmedabad to Mumbai one-way, a distance of 500 km, will take about 2 hours' time and cost about Rs. 3,000 to Rs. 3,500. The total cost of building the Mumbai-Ahmedabad line is about Rs. 1,10,000 crore. India is currently investing 20 percent of the total amount. The rest has been coming from Japan at a cheap rate of 0.1 percent for 50 years, expandable to 65 years. It means if you look at the govt. investment, it is almost 100 crore a year, which is approximately 0.000008 percent of the Indian GDP. So economically, it is viable. The Indian Railways' budgeted amount of around Rs.1,21,000 crore that he cites is just annual incremental capital outlay. This amount falls far short of even IR's annual ordinary working expenses. The resources required for running 12,000 passengers and 6,000 freight trains daily would amount to an estimated figure, covering the cost of tracks, locomotives, coaches, ancillary infrastructure and workforce.

To estimate the revenue we can take a simple calculation:

- Based on the data from other countries, each train will carry an estimated, 800 to 1400 people one way, lets take 1,000 for this calculation.
- Although trains run round the clock, for this calculation – let's say the train run only between 6 AM to 10 PM and leaves every 30 mins from each side, i.e. 34 trains one way, and total of 68 trips. Note that this is a very reasonable number concerning that there are 150+ flights each day between the two cities. The estimated ticket price is between Rs. 3,000 and Rs. 3,500. Lets

say that the tickets are priced at Rs. 3000 one way. So the total income over a year = $365 \times (1000 \times 68 \times 3000) = \text{Rs. } 7.5 \text{ thousand crores.}$

Considering the revenue only from tickets, ignoring those from vendors, advertisements etc., in all likelihood, the entire project will be paid in less than 10 yrs.

Benefits from the Mumbai Ahmedabad Railway Corridor

1. **High-speed connectivity** - The bullet train running between Ahmedabad and Mumbai will cover the distance of 508 km within two to three hours. The project is supposed to connect bustling economic corridors in the states of Gujarat and Maharashtra. This will facilitate economic growth. Smaller cities along the way can also be connected with a high-speed transit facility to these economic centres through the bullet train network.
2. **Employment** - The bullet train project will bring speed and employment, PM Modi said during its inauguration. The bullet train project is expected to create 5,000 direct job opportunities, along with 25,000 indirect jobs. 30,000 construction workers will also be employed during the set up period of Ahmedabad-Mumbai bullet train.
3. **Urban expansion** - New bullet train stations set to come up along the route will attract urban growth. This will again shift the pressure of urbanization from the existing urban centres.
4. **Open new avenues** - When completed, the Ahmedabad-Mumbai bullet train project will present as a favorable destination for high-speed train technologies, attracting other parties working in the field.
5. **Speed:** High speed is one of the biggest reasons for the proposal of this idea when it was first initiated in India. Major cities connecting with towns of economic growth face the problem of fast transportation. This would save time and boost businesses amongst the connected cities. Reduction in commuting time is greatly required in Mumbai and other metro cities where a lot of time is consumed in the process.
6. **Comfort:** These trains would utilize high-grade technology to provide comfortable journey of long hours within just a few hours. Improvising on the comfort level of train journeys have been a missing factor in Indian railways and the introduction of bullet trains would be a great development in this factor.
7. **Safety:** Earlier there were questions raised on the safety issues of these high-speed trains but the Shinkansen network of Japan shows excellent records of safety. Ever since the bullet trains started in 1964, the Shinkansen has reported zero fatalities.
8. **Avoid overcrowding:** Making commuting easier from small town to major cities would lessen the crowd of settlement and migration in major cities which would reduce pressure on growing urban areas. Chief Minister has rightly mentioned decongestion of Bangalore as one of the reasons for the bullet train.
9. **Stronger and eco-friendly:** Not only these High speed trains are stronger enough to carry heavier weight but are also eco-friendly as they do not require deforestations to set tracks. It is a modern and technologically advanced means of transportation which can be a step towards growth and development in India.

Cons of bullet trains

1. **Cost of construction:** The cost of laying a bullet-train corridor is estimated to cost up to Rs.100 crore a kilometre. After summing up the costs of signals, rolling stock, etc, the cost can rise up to Rs. 115 crore a km. Operation and maintenance costs would also be high.

2. **High fares:** Fares of these trains would be high too in order to compensate the expenses and maintenance. One-way fare on Mumbai-Ahmadabad route is projected to be around Rs. 3,500. Quite few people would be able to afford travelling with these expenses. Mostly people having business will prefer it. If this factor is not considered, then the project might prove to be a loss for the government.

3. **Time consuming project:** The project is at its initial level of planning and it is predicted that the implementation of the plan would take years. In between if, there is a change in government, and then the project could face the consequences.

4. **Land acquisition:** For laying tracks, there would be issues of land acquisition, which might trigger anger amongst commoners whose everyday living might come under menace. For instance laying these tracks in Mumbai would require acquisition of land, which has the largest slums in the city. Relocation of slums people will be a major challenge.

5. **Other issues:** This project might have other issues under India's present condition including plaguing of power sector, choice of speed and gauge, minimum length of the route for the viability of the project, etc. It is important to understand whether or not India is ready for this change.

Conclusion

The complexity of the project also arises due to a variety of socio-economic implications like land acquisition, rehabilitation, and environmental concerns. Even though there are many positive benefits and externalities of the high-speed rail, which would be useful in overall stimulating development. Mumbai - Ahmedabad route is the right choice for the first route. It connects India's first and seventh most populous cities, with significant economic growth in the 500 km corridor between them. So overall, an investment in high-speed rail corridor:

- Will increase our efficiency, skills and efficiency
- Environment-friendly,
- Economically and Financially feasible,
- Empower the businesses and the ordinary person.
- Ease of Travel

Sure, there are and will be challenges. There will be challenges regarding traffic optimization, finances, construction, land acquisition and many more. In different infrastructure projects done in India, it was made possible. Several projects have been very challenging yet were completed with enormous success, e.g., Konkan Railways, Kolkata Metro, and BRTS. A few years down the line Mumbai Ahmedabad Rail Corridor potentially be just another success soon to be making the news. It is this uniqueness, which Japan brings to India through the high-speed train project. It can catalyze Indian Railways to transform itself and become a global leader in size, scale, skill and safety.

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