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# Political Economy of High Speed Rails in India

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**Abstract**

Discussions of High-Speed Rails (HSR) in India generates a lot of interest among the general public, media houses, politicians, and urban planners. Some tout it as an economic driver, an epitome of development, and as a competition with its economic rival China, while others believe it to be a wastage of resources and the idea of bullet trains to be replete with deep contradictions. Whatever the reason may be, bullet trains like that of the metro have been a successful political campaign, and have provided the dividend. Now when India is building its first High-Speed Rail (Bullet Trains) from Ahmedabad to Mumbai, it seems to be the opportune time to look into the political economy of such a mega project. The issues in developing an HSR network in India are complex. Given that India is a developing country, the primary concern is whether the funds for such a project could be better utilized in other domains, including in upgrading conventional rail. The complexity of the project also arises due to a variety of socio-economic implications like land acquisition, rehabilitation, and environmental concerns. This paper critically looks and understand the political as well as economic discourse surrounding High-Speed Rails in India with Ahmedabad-Mumbai project as a case study.



*Keywords:* Type your keywords here, separated by semicolons ;

## 1. Introduction

Indian Railways (IR) has been considering two options for speeding up the rail route network the building of dedicated HSR lines and upgrading the existing tracks to semi-HSR lines. Both the options have their own advantages and disadvantages. HSR caters to speeds of up to 350 kmph while semi-HSR up to 200 kmph. In February 2012, Railway Ministry's the expert group report for modernization of Indian Railways chaired by Sam Pitroda proposed the following recommendation regarding High Speed Passenger Train Corridors:

- Construct a High-Speed railway line between Ahmedabad & Mumbai with speed of 350 kmph.
- Undertake detailed studies for 6 other High-Speed rail corridors already identified. These include
- Delhi-Chandigarh-Amritsar (450 km)
- Hyderabad-Dornakal-Vijayawada-Chennai (664 km)

- Howrah-Haldia (135 km)
- Chennai-Bangalore-Coimbatore-Ernakulam (850km)
- Delhi-Agra-Lucknow-Varanasi-Patna (991 km)
- Ernakulam-Trivandrum (194 km).

This was a part of 15 points recommendation to modernize the Indian Railway. The recommendations included modernizing the existing tracks & rolling stocks, automating the signals, creating a dedicated freight corridor and high-speed passenger train among others.

The rationale given behind the high-speed rail corridor was increased connectivity, traffic, and faster intercity travel. The cost of the high-speed line between Ahmedabad & Mumbai was estimated to be Rs. 60,000 crores. This cost was included in a PPP initiative, and the proposed timeframe for the project was 10 years. All this was done in UPA II government when Dinesh Trivedi was railway minister.

Following that India and Japan signed a Memorandum of Understanding (MoU) to undertake a joint feasibility study of the Mumbai-Ahmedabad route in New Delhi in September 2013. The objective of the joint study was to prepare a feasibility report of the system with a speed of 300–350 km/h. The study was scheduled to be completed within 18 months, i.e. by July 2015.

In 2014 new central government came to power under Prime Minister Narendra Modi. While presenting the new government's first railway budget in Parliament in July 2014, Mr. Sadananda Gowda, the then railway minister declared that India's first bullet train will run in Narendra Modi's home state Gujarat. At the time, he had mentioned that it will cost Rs 60,000 Crores. G Deepshikha (2014) On 21 July 2015, the Japan International Cooperation Agency (JICA) submitted the final report on the feasibility study of the proposed high-speed rail system on the Mumbai-Ahmedabad route to the Railway Minister, estimating the ambitious project would cost Rs 98,805 crore. JICA (2017)

After the study of the financial feasibility of the line, the final JICA report suggested that fare of the bullet train between Mumbai and Ahmedabad should be somewhere around one and half times more than the fare of the first AC of Rajdhani Express and it would be around Rs 2,800. It also estimated that by 2023 around 40,000 passengers are expected to avail this service daily and only then it would be a financially viable one.

In December 2015, during an eventful trip to India by Japanese PM Shinzo Abe, a deal was signed between India and Japan for this bullet train project. Interestingly enough Japan had failed to win a high-speed train deal in Indonesia earlier that year, losing out to a Chinese proposal. Japan also offered to finance the project and give a loan at 0.1% interest rate. Media, as well as the government, celebrated the news. Prime Minister Modi said that effectively the cost of the project would be "free". "If somebody tells you to take a loan and return it not in 10 or 20 but in 50 years, will you believe it? India has got such a friend (Japan) which has promised to provide Rs 88,000 crore loan at 0.1% interest." A simple look at the history of interest rates in Japanese Yen loans will tell you that they have been near zero, and sometimes even negative, in the past 10 years. Many business analysts have pointed out that the repayment amount will amount to ₹1.5 lakh crore over 20 years allowing for exchange rates and comparative inflation.

As of February 2018, most of the express trains in India were running at top speeds of 110 kmph. The Bhopal Shatabdi Express was India's fastest train with a top speed of 150 kmph. Longer distance trains like the Rajdhani Express had top speeds of 130 kmph. Gatimaan Express, the semi-HSR service planned between the 200 km Delhi Agra stretch, was expected to run at top speeds of 160 kmph. Though originally scheduled to be launched in 2015, safety requirements of the Commission of Railway Safety (CRS) caused delays. Delhi to Agra in 90 minutes flat. The Hindu (2016) Though originally planned to cover the stretch for 90 minutes, the trial run on March 22, 2016, took 113 minutes, just four minutes faster than the time taken by the Shatabdi Express. This was due to a variety of inhibiting factors including 19 'caution points' (curves, bridges and populated sections) and the Mathura railway yard which needs signaling up gradation. Dastidar A. G. (2016)

## 2. High-Speed Rail around the World

In this section, I look at three key cases of HSR network development in the world: Japan, France, and Germany. This is based on the review of the existing literature. These HSR experience in three countries are among the most thoroughly documented, and there is sufficient information to understand the impact of HSR and to draw conclusions and lessons from it.

**2.1. Japan: Shinkansen**

Japan was a pioneer in the building of high-speed trains. The first link in its network, connecting Tokyo to Osaka, came into service in 1964. The objective pursued by early planners was to reduce the travel time between the two cities—standing almost 560 km apart—to three hours. The main motivation underlying this policy was to promote mobility demand in this corridor because of the rapid economic growth experienced after World War II. Givoni, M (2006)

Construction costs for the 560 km of track between Tokyo and Osaka were $0.92 billion in 1964. Later on, three other HSR lines were constructed: Sanyo (626 km), Tohoku (540 km), and Joetsu (336 km). These lines were considerably more expensive than the initial one. Demand forecasts for the Tokyo - Osaka line proved to be underestimated. While the number of passengers per kilometer (millions) was 11,000 in 1965, in just 10 years, it had risen to 35,000.

The Shinkansen network was privatized when the JR Group (consisting of four companies) took over from the Japan National Railways in 1987. The dedicated network uses the standard gauge, though the earlier rail networks in Japan used a narrow gauge of 1067 mm. Known for its safety record of zero fatalities since 1964, Shinkansen has epitomized the high safety levels of HSR compared to other transport modes. With respect to air pollution, the amount of CO2 per unit transport volume produced directly by the Shinkansen is only 16% that of a passenger car. The Japanese HSR also maintains a high degree of punctuality, which becomes all the more important given the tight schedules of the high traffic network. As of 2011, the total traffic in the Japanese HSR had crossed 318 million per annum.

**2.2 France: Train à Grande Vitesse (TGV)**

The level of congestion on the rail link joining Paris and Lyon—the gateway to southeastern France—led to the introduction of HSR service in France with the building of a new, separate network. The line, named "Paris Sud-Est," was constructed between 1975 and 1983. The total number of rail passengers increased following its inauguration, rising from 12.5 million in 1980 to 22.9 million in 1992—18.9 million of whom were HSR passengers. Vickerman, R (1997)

The subsequent expansion of the HSR network was carried out chiefly to serve corridors with sufficient traffic, connecting cities of significant size. The policy was to invest only in socially profitable lines that is, lines generating a positive net social return on investment. In fact, the French HSR was developed under a state-directed policy that insisted on cost containment and commercial viability. D James, and A Perl (1994)

Its success led to the promotion of an investment plan that provided the funds to construct connections from Paris to Le Mans (1989), Tours (1990) and Calais (1993). The Rhône–Alps (1994) and the Mediterranée (2001). Today, France's HSR network comprises 1,895 km of line. Traffic demands, time savings, and construction costs were all considered in the French project. Indeed, France decided only to create new, separate networks along congested links and to use conventional services along less crowded connections and for accessing big cities.

As a result, and in contrast to Japan, France has a mixed HSR infrastructure system. In fact, the current share of HSR lines over the total network is just 37 percent, serving more than 100 million travelers. However, even with this system, commercial speeds fluctuate between 240 kmph and 320 kmph but are lower on the conventional network (210 kmph). All in all, HSR has meant an 80 percent increase in speeds on average. C Javier, and G Rus (2009)

**2.3 Germany: Neubaustrecken**

The German InterCity Express arrived a decade after the French HSR (1991). There were several reasons for this delay. Besides the problems of constructing an HSR system in the country's mountainous terrain, it proved considerably more complicated to obtain the necessary legal and political approval for construction to start D James, and A Perl (1994). Moreover, the rationale underpinning the HSR network was somewhat different in Germany. Given the west-east orientation of the rail network constructed before World War II and the current north-south patterns of industrial cooperation, Germany sought to reform the network so as to facilitate freight transportation from the northern ports to the southern industrial territories. For this reason, the first two Neubaustrecken—new lines—were those linking Hannover to Würzburg and Mannheim to Stuttgart. The main goal was to solve congestion problems in certain corridors and to improve north-south freight traffic. Following the country's political reunification, the need to connect east and west became an additional priority, which explains why the Wolfsburg' Berlin and Nuremberg–Leipzig corridors were the next links to be constructed. G P Javier (2005)

Thus, there are considerable differences between the German strategy and the models adopted by Japan and France. Instead of building new exclusive high-speed lines, Germany chose to operate a system that would serve freight traffic, too. D James, and A Perl (1994). This resulted in much higher upgrading costs and operating costs. Therefore, in most instances, Germany did not build a separate HSR rail network but rather upgraded existing lines. This meant that the network was shared by high-speed and more conventional passenger trains together with freight trains.

The main consideration when designing the new lines was not faster passenger traffic, but the highly profitable overnight traffic between the North Sea ports and the industrial areas and consumer markets in southern Germany. Goods transport was deemed more important because it contributes considerably more to the turnover than the passenger traffic H Roland (1992). A further difference with the HSR in France is that the HSRs in Germany are heavier, wider, and more expensive to run but offer greater flexibility D James, and A Perl (1994).

However, from a financial perspective, building delays and Germany's topography resulted in higher than expected construction cost, as well as operating deficits and increasing debt burdens, which increased financial pressures to reform the system D James, and A Perl (1994). As a consequence, the German lines have been much more expensive than the French lines, a situation that can be attributed to the more challenging nature of the terrain, its urban structure, and political and legal obstacles. Furthermore, the network serves only around 67 million passengers a year. For this reason, the utility of continuing investment in HSR is being questioned, as it is seen as an expensive solution that might not provide the gains that could be achieved with a more restrictive approach to road transport Vickerman, R (1997).

## 3. HSR as a Substitute to the Aircraft

Much attention is given to the HSR as a substitute to the aircraft and as a possible solution to the congestion and environmental problems faced by the air transport industry, although substituting the aircraft is not the main reason for introducing HSRs. Givoni, M. (2005) Due to its speed and the location of most HSR stations at the city center, the HSR can offer comparable or shorter travel times than the aircraft on some routes and can therefore substitute it. The travel time advantage depends on the average speed of the HSR service and the distance each mode has to cover, since trains do not necessarily follow the direct route. For example, on a journey between London and Paris, the HSR passes almost 500 km while the aircraft only 380 km. Givoni, M (2006)

In general, on routes of around 300 km, evidence shows that the introduction of HSR services almost leads to a withdrawal of aircraft services (e.g. between Tokyo and Nagoya and between Brussels and Paris), while on routes of around 1000 km and above, the HSR ceases to be a good substitute for the aircraft (e.g. between Tokyo and Fukuoka, 1070 km, the HSR share of the traffic is only 10%). In between these distances, there is usually direct competition between the modes. Givoni, M. (2005)

In most cases, competition is also between the operators, the airlines and the railways. This competition means that HSR services are added to the aircraft services and not really substituting them. On the London–Paris route the HSR captures about 70% of the market, but the airlines still offer about 60 flights a day just between London Heathrow and Paris Charles de Gaulle (CDG), two of the most congested airports and one of the most congested routes in Europe. Givoni, M (2006)

Air France uses the HSR to replace the aircraft on routes from CDG to Brussels, and on other routes it uses it to complement the aircraft. Furthermore, Airlines such as Emirates, American Airlines and United Airlines use HSR services from CDG to complement their flights into Paris. Givoni, M (2006) In addition, integration of airline and railway services that lead to real mode substitution. The Japanese realized the potential is such integration and the planned MAGLEV Chuo Shinkansen will include, according to plans, stations at Narita and Haneda airports in Tokyo and Kansai airport in Osaka, connecting the three biggest airports in the country.

However, considering the forecast growth in demand for air services, the air transport industry would not meet future demand at current runway capacity even if the HSR will substitute the aircraft on all routes where it can lead to travel time savings. Nevertheless, the HSR has an important role to play in the future of the air transport industry and in relieving the congestion and environmental problems it faces. Givoni, M. (2005)

In summary, it is through integration between the two modes, and not competition, that the air transport industry will see an opportunity in HSR services and will strive to substitute the aircraft by HSR on routes where the latter offers travel time savings. (For more look at Givoni, M. (2005)

## 4. Environmental Impacts of HSR

The impact of HSR on the environment is usually portrayed in a positive light since it is considered to impact the environment less than other modes of transport, especially the aircraft. However, there does not exist enough evidence to prove that. On the contrary, HSR operations lead to negative environmental impacts including local air pollution, climate change, noise and land take.

HSRs are predominantly electric powered and therefore emissions from HSR operations are considered to be linearly related to energy consumption and the sources used to generate the electricity. The higher the level of renewable sources and nuclear power used to generate the electricity, the lower the level of emission associated with HSR operations. Usually, it is assumed that the electricity is supplied from the national grid and emission is calculated based on the average electricity generation mix Givoni, M (2006) . The use of electric power also means virtually zero emissions from the HSR along the line and at the stations. The most harmful pollutants related to HSR operation are sulphur dioxide (SO2) and nitrogen oxides (NOx). SO2 affect the environment mainly by contributing to LAP, and NOx to both LAP and climate change.

In general, HSR operations are not considered to contribute significantly to climate change, while their contribution to LAP can be significant depending mainly on the levels of SO2 emission associated with HSR operations Givoni, M. (2005) . These levels depend mainly on the share of coal used to generate the electricity.

Along the HSR lines, noise nuisance from HSR operations can be considered as the main environmental impact of the HSR. The level of noise generated depends mainly on the speed of the train. At speeds between 50 and 300 kph, rolling noise is the most important noise source Brons, M. et. al (2003) and it depends mainly on the smoothness of the wheels and railhead.

The high standards of the HSR infrastructure (the trains used and the construction and maintenance standards) probably leads to less noise generated from HSR operations in comparison with conventional trains running at the same speed. Only at speeds above 300 kph does aerodynamics become the main source of noise. Thus, even for HSRs, rolling noise is probably the dominant source of noise Brons, M. et. al (2003). At high speeds HSR operations result in high levels of noise, yet the impact of this (the actual noise heard and number of people exposed to it) is lower than can be expected since in densely populated areas the speed of the HSR is usually at its lowest because of the distance required for the HSR to stop, which means speed is reduced far from the station). Commission for Integrated Transport (2001)

Since the introduction of HSR services often involves the construction of new railway lines, land-acquisition is an important environmental impact related to HSRs. Land- acquisition leads to other environmental impacts including habitat loss, fragmentation and community severance. Commission for Integrated Transport (2001)

In comparison with other modes, HSR operations result in less environmental impact than aircraft operations in terms of LAP and climate change impacts on all the routes where the modes compete (Givoni, 2005). In terms of LAP, the advantage of the HSR depends mainly on the level of SO2 emissions related to HSR operations. The impact of aircraft operations on climate change is higher than the impact of the HSR due to higher emission rates of carbon dioxide and NOx and the fact that NOx emissions at high altitude effect climate change much more than emissions at ground level, by a factor of more than 100. Givoni, M (2006)

With regard to noise pollution, it is less clear whether the aircraft or the HSR leads to more noise pollution, and analysis on a route basis is required yet it is easier to provide protection from railway noise than from aircraft noise. Commission for Integrated Transport (2001) Less evidence is available on whether an HSR or a car journey has more impact on the environment in terms of emissions. Commission for Integrated Transport (2001) suggest that HSR operations result in lower energy consumption and less emissions, but because HSR operations result in more

$SO_2$ emissions, it might result overall in a higher impact on the environment through a higher LAP impact (since different pollutants have different impacts and comparing only emissions might be misleading).

In conclusion, HSR infrastructure and operations certainly result in adverse impacts on the environment, mainly by affecting LAP, causing a noise nuisance and consuming land. There is also evidence that HSR operations impact the environment less than the aircraft and the car when these modes are compared on the same basis. However, whether the introduction of new HSR infrastructure and services leads to environmental benefits is less clear. This depends on the balance between the substitution effect (how many passengers using the HSR were shifted from the aircraft and the car) and the traffic generation effect (how much new demand was generated by the HSR). In addition, the environmental benefits gained from the substitution effect depend on how the freed capacity (on the road and runway) is used. If this capacity is used, e.g. for the airlines to offer more (long-haul) flights, then mode substitution will increase the environmental impact. Givoni, M (2006)

## 5. Mumbai Ahmedabad High-Speed Rail

The Mumbai-Ahmedabad HSR costs around ₹1 lakh crore (4). Estimates in the project report by the Indian Institute of Management, Ahmedabad show that at least 40,000 passengers at fares of ₹2,800 would be required daily for the project to break even. The tariff is too high — airfares between the two cities are around ₹2,500. Subsidies, in this case, appear inevitable. Daniyal S (2015)

A myth being propagated is that this project will have knock-on effects on technology absorption by India through future HSR projects, but it is not the case as there is no technology transfer. Another myth is that the Japanese funding at 0.1% interest with a 15-year moratorium is “almost free.” Many business analysts have pointed out that the repayment amount will amount to ₹1.5 lakh crore over 20 years allowing for exchange rates and comparative inflation. It seems like the bullet train is a wasteful project which only serves to deliver an illusory feel-good perception among the wealthy.

The JICA feasibility study itself had suggested that the project needs to have 40,000 passengers daily at a fare of Rs 2800, in order to be financially viable. An IIM report states that if Railways set the ticket price at Rs 1,500 per person 15 years after the operation, it will have to ferry between 88,000 and 110,000 passengers every day to ensure it repays the loans on time. Daniyal S (2015) As the capacity of the bullet train is 750 passengers, although this can possibly be increased to nearly 1000, this will need about 100 trains daily, one every 15 minutes, (or one every half an hour from each direction). Both these studies imply an annual operating cost of over Rs 4000 Crores. Now, ignoring the fact that some of these people can take a 1-hour flight, which if booked in advance can be bought for anywhere between 1,700 to 2,700 rupees, it is difficult to establish the demand here.

10.8 million People travel across the country on trains on any given day, which is around 0.9% of the country’s population. The total population of Greater Mumbai region is 18 million, and that of Ahmedabad about 6 million. Overall, we are looking at a region with a population of 2.5 crores in total. Going by our national average, about 1% or, 2.5 lakhs from these cities are traveling in long-distance trains every day. It would require that 40% of all long-distance travelers from Mumbai are to Ahmedabad every day, and they need to take the Bullet train. A tiny fraction of our population uses even the current Air Conditioned classes, and we are expecting so many people to afford a Bullet train fare daily. An RTI revealed that 40% of the seats in the 32 current mail and express trains between Mumbai and Ahmedabad remained vacant in the past quarter, causing a loss of Rs 30 Crores to the Indian Railways. NDTV (2017)

For railways, an amount in the order of 1 lakh crore could have been spent on upgrading the tracks and signaling system in the whole network, revamping all rolling stock, fixing all level crossings, and improving safety on a network that causes 15,000 deaths every year, as Kakodkar committee had recommended in 2012. Instead of fixing these issues on our 65,000 Km network used by 3 Crore Indians daily, we are blowing up this amount on 500 km of bullet train tracks that will be used by less than 0.3% of total train travelers in India, even by the most optimistic projections. Railway Technology Report (2017)

The Japanese had themselves recommended semi-high speed trains for the Delhi-Mumbai route when the western freight corridor became operational. The study for METI mentioned earlier estimated the cost of a semi-high speed line with a journey time of twelve hours to be $6.85 billion (Rs 45,900 Crore). This would jump to $16.34

billion (Rs 109,500 Crore) for a ten-hour journey route, at an average speed of 140 kmph. Overnight journeys between the two metros would be possible compared to current sixteen-hour journeys by the Rajdhani at the average speed of 87 kmph.

It is not even clear if there was any competitive bidding process for such a huge project. Current estimated cost is $32 Million/km. For comparison, China built its high-speed network at $17-21 Million/km, and Europe at $25-39 Million/km. An average hour-long trip in the Shinkansen trains in Japan costs about $100. These high-speed trains barely make even their operational cost; they do not generate any profit. World Bank Report (2017)

## 6. Conclusion

The issues in developing a HSR network in India are complex. Given that India is a developing country, the primary concern is whether the funds for such a project could be better utilised in other domains, including in upgrading conventional rail. The complexity of the project also arises due a variety of socio-economic implications like land acquisition, rehabilitation, and environmental concerns.

Constructing HSR from Ahmedabad to Mumbai does not make sense economically though it might have some benefit in the long run. Given finite funds, If India had to choose between rail services that would give the biggest benefit for money, it would opt for 160-200 kmph semi-high speed trains connecting the metros with satellite cities that would make quick getaways possible. Such services would de-congest the metros, improve the quality of life and spread economic development around.

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