Lesson Learned from Developing Countries

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Abstract

The plan to build a high-speed railway has existed for years. The project was pursued by Japan and China, both having the technological capacity to build a railway that would connect Jakarta and Bandung. China won the project due to its readiness to provide guarantee-free loans, while Japan requested Indonesian government funding. The line will cut travel time between the two cities from about three hours by car to just 45 minutes. The project will include integration of the high-speed railway stations with developments along its corridor through transit oriented developments. The line would attract around 10 million passengers per year in first year of operation. This high figure reflects the high population density of Jakarta, and the large number of origin destination pairs that the line would serve.

Keywords: high-speed railway, Indonesia, travel time, ridership, transit oriented development

1. Introduction

The railway system in Indonesia was established in the second half of the 19th century under the Dutch colonial administration. Rail was a very important mode of cargo and passenger's transportation, and when at its peak in 1939, the total railway length was 6,324 km on Java and 1,833 km on Sumatera. However, 70 years later the figures had fallen substantially to 3,464 km on Java and 1,350 km on Sumatera Island [1]. Competition with road transport was the primary reason for this decline. Nevertheless, rail is still considered more superior than other modes of transport for a number of reasons: loading capacity, energy and space efficiency, safety, and less pollution and carbon emission. For those reasons, Law No. 23/2007 on railways was enacted to make rail an important mode of transport again. The law stipulates that a Master Plan of National Railway (Rencana Induk Perkeretaapian Nasional or RIPN) be formulated to guide the development of the national railway system. The Directorate General of Railway that was created in the Ministry of Transportation then formulated this master plan in 2011. The master plan's strategy is to develop network and services on the major islands. One of several targets to achieve by 2030 is the extension of the network up to 12,100 km in all major islands, including 3,800 km of

urban railway network. On Java, the network development plans include: intercity network with double tracks; urban agglomeration area network; urban network in six major cities; railway link to six major airports; railway link to six major seaports; high-speed rail between Merak and Banyuwangi; extension of urban network with electric railway; and revitalization of the old network (Directorate General of Railway, Ministry of Transportation, 2011). The planned high-speed rail network will connect Merak on the western tip of Java to Jakarta, Cirebon, Semarang, Surabaya, and then Banyuwangi on the eastern tip of the island. As can be seen on the map of high-speed rail network planned for Java in 2030 (Figure 1), the priority is to connect Jakarta and Surabaya, the two largest cities in Indonesia, and then to extend the network from Jakarta to Merak in the west and from Surabaya to Banyuwangi in the east. There was no plan to build a Jakarta-Bandung high-speed rail until concurrent with the Master Plan of National Railway, where the Coordinating Ministry for Economic Affairs released the Master Plan for Acceleration and Expansion of Indonesian Economic Development (MP3EI) in which economic corridors are to be developed on major islands. On Java, the two main economic knots are Jabodetabek (Jakarta Metropolitan Area) and Gerbangkertosusila (Surabaya Metropolitan Area). These two metropolitan areas are to be connected to each other by a trans-Java toll road and a high-speed railway. The plan does not clearly mention the Jakarta-Bandung high-speed railway although the map vaguely draws a railway line between Jakarta and Bandung [2]. This was discerned by the Japanese government, which assisted the Indonesian government in drawing up a Master Plan for the Jabodetabek Metropolitan Priority Area (MPA), in which the high-speed railway between Jakarta and Bandung was stated as one of several major priority projects. It is important to note that the proposal considers connecting Jakarta and Bandung via a new international airport to be built at Karawang, West Java [3]. However, the proposal was eventually rejected as the provincial government of West Java had already chosen Kertajati in Majalengka regency as the site of its international airport.

2. Early Japanese's Proposal

Since 2008, Japan has been long-nurtured the plan to export their Shinkansen high-speed railway technology to Indonesia. During Indonesia-Japan Friendship Festival in November 2008, Japan has showcased their Shinkansen technology to impress Indonesian audiences. In 2009, a Japanese government-sponsored feasibility study was conducted for the planning of project – a high speed (300 km/hour) rail line extending 730 kilometers across the island of Java from Jakarta to Surabaya. The idea of high-speed rail backed by funding (soft loans) has been proposed by Japan International Cooperation Agency (JICA) for the Indonesian island of Java, linking up the densely populated corridor from the capital Jakarta to Surabaya (730 km). The island, similar in many respects to pre-HSR Honshu, suffers greatly from both freight and passenger congestion. The idea has been around for some years, however, a new proposal to divide the project into stages has emerged, with the first stage from Jakarta to Bandung, 150 km to 35 minutes, from current conventional train time of 3 hours at a price of 50 trillion rupiah. The JICA detailed feasibility study was finished in 2014, following up on an initial study in 2012. By 2013 Indonesia has been undergoing a

revival in railway expansion and upgrades in recent years. High-speed corridors have been proposed but not implemented. Japan – with its reputation as a world-class train-maker – seemed destined to win the contract. However, in 2014 Indonesian government changes, as Joko Widodo swore as a new president in October 2014. In January 2015 the Joko administration essentially stopped preparations for the high-speed rail project, citing that the high-speed rail project is too costly and there are more pressing infrastructure needs in outlying underdeveloped islands outside of Java. Japanese domination in high-speed rail project seemed to be unchallenged. However, that was until April 2015 when China had entered the race with a counter-offer. In March 2015, Joko Widodo traveled to Tokyo and Beijing. In Tokyo March 22–25 Joko Widodo met Japanese Prime Minister Shinzo Abe, Joko got a commitment for Japanese loan support for improving Jakarta's municipal rail network, but no progress was made on resolving issues with the Jakarta–Bandung high-speed rail project. In Java Island alone where the population is more than 100 million, the transportation infrastructure has not been developed sufficiently to cope with such a large scale of population. The railway service, in particular, is less competitive in terms of the required time than passenger cars, so that more than 80 % of passengers rely on the passenger cars as transportation means. Therefore, since the traffic congestion has been serious due to the increasing number of cars mainly in the urban areas, the necessity of inter-city connection by railway has been identified. According to the national development plan called "Masterplan for Acceleration and Expansion of Indonesia Economic Development (MP3EI)", the development of the high-speed railway between both Jakarta-Bandung and Jakarta-Surabaya is recognized as one of the corridor transportation infrastructures to support economic development. Moreover, the National Railway Master Plan (NRMP) also highlights the development of Jakarta-Surabaya high-speed railway. In addition, the high-speed railway between Jakarta and Bandung is nominated as Priority Project in Master Plan for JABODETABEK Metropolitan Priority Area (MPA) which is jointly conducted by both Indonesian and Japanese governments. In 2008, the feasibility for introducing the high-speed railway between Jakarta and Surabaya for about 700 km was examined, but the project cost was estimated as JPY 2.1 trillion which was not practical for the Indonesian government. Thus, the study for the high-speed railway in the section between Jakarta and Bandung was carried out by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in Japan. In accordance with the result of this study, the Indonesian government requested the Japanese government to conduct more practical study including the examination of the prior development route (Jakarta-Bandung section), the possibility of future extension (Bandung-Cirebon), and the project scheme. Therefore, in the Study, the proper route is examined for the high-speed railway between Jakarta and Cirebon as a priority section in the Jakarta-Surabaya high-speed railway plan by comparing two routes (Bandung Route and Coastal Route). In addition to those two routes, the section between Jakarta-Bandung-Gedebage in the Bandung Route is analyzed (Figure 1). Therefore, concerning those three alternative routes, the appropriate route is selected by the technical, economic, financial and project scheme analysis on the selected one route. Moreover, as positive impacts to Japan, various railway related companies with superior

technologies of rolling stocks, signals and communications, etc. are expected to expand their business opportunities into foreign market by exporting the Japanese Shinkansen.

Figure 1 Proposed route [4]

In the previous study conducted by the MLIT in Japan, the proper route is examined for the high-speed railway between Jakarta and Cirebon as a priority section in the Jakarta-Surabaya high-speed railway plan. For the comparison of the routes, three alternatives are considered: Bandung Route (Jakarta-Bandung-Cirebon), Coastal Route (Jakarta-Cirebon) and Jakarta-Bandung-Gedebage in the Bandung Route as the first phase of the construction as shown in Table 1.

Table 1 Outline of alternative routes [4]

Route	Section	Outline
Bandung Route	Jakarta-Bandung-Cirebon	Route connecting to the third largest city of Bandung and to Karawang and Kertajati where construction of the international airport is planned. This is also the route where the high demand is expected. Total length is 256.0 km
	Jakarta-Bandung-Gedebage	Route connecting to Gedebage via Bandung as first phase of Bandung Route Total length is 144.6 km
Coastal	Jakarta-	Route connecting Jakarta and Cirebon with almost the shortest

Route	Cirebon	distance Total length is 207.3 km

For the route selection, it is considered to connect stations with the shortest distance. The continuous straight and horizontal sections are needed as long as possible not to prevent the high speed operation. Even when inevitable due to geological reasons, the steepest slope shall be 30‰. In order to avoid excessive loading to the cars, the steep slope sections shall not be continuous. Considering the land acquisition, the areas for existing toll roads and conventional railways will be utilized as long as available. Interference with the urban area, factories, commercial facilities, grave, mosque, and other public facilities shall be avoided as much as possible. In particular, in the center of DKI Jakarta, the route will be taken under the ground because it has been developed. In principle, access to the planned airport will be an underground structure. The structure may be on the ground if the opening schedule and development location of airport are not fixed. Moreover, the route crosses the principal roads, toll roads and conventional railways as flyover with the specified clearance. Since the stations for the high-speed railway are assumed mainly for use as passenger stations, the location of the station shall be convenient for the passengers to reach and with easy access to other transport means. However, it may be more rational to establish a new station in the suburb and to develop its surrounding area because the land acquisition is difficult in the urban area and the railway route will be restricted. Moreover, unless otherwise specific reason, the distance between each station of the high-speed railway will be planned with 20 km or more to avoid lowering of the schedule speed. Regarding the structure, to avoid excessively long bridge, the route will cross a large river at a right angle as much as possible. In addition, the maximum length of a tunnel will be less than 20 km, and the vertical alignment of tunnel section shall be determined in consideration of the excavation direction and drainage system. The route shall avoid the disaster hazard areas, such as landslide and fault as much as possible. Moreover, the route needs to avoid passing near the area where adverse impacts on the natural environment, animal protection, etc., are predicted. Table 2 shows the result of comparative analysis of alternative routes in terms of the route length, topographic characteristics, linkage with other transport means and disaster risks. While the Bandung Route has the steep slope and requires the relatively long tunnel, the Coastal Route runs through the alluvial plain of soft ground. Therefore, the structures shall have the sufficient earthquake resistance. On the other hand, Japan has the experiences of design and construction to cope with those similar issues, so that there will be no technical problems for both routes.

Table 2 Comparison of alternative routes [4]

Item	Bandung Route		Coastal Route
	Jakarta-Cirebon	Jakarta-Gedebage	
Length	256.0 km	144.6 km	207.3 km
Topographic Characteristics	Steep slope of maximum 30‰ use to overcome the elevation of 700 m		Not much undulation because the route mainly runs through the plain
Linkage with other Traffic Means	Connect with conventional lines in principal cities and satisfactory accessibility to the planned international airport		Connected to the conventional line in Jakarta, Cikampek, Cirebon
Disaster Risk	Relatively resistive against disaster because of high ratio of tunnel sections less affected by meteorological conditions		As the route passes through the flood-prone plain of soft ground, the route is readily affected by earthquake and weather

The technical specifications of the high-speed railway proposed for Jakarta-Bandung-Cirebon are summarized in Table 3.

Table 3 Technical specification of HSR proposed [4]

Parameter		Data
Track Gauge		1,435
Power Supply System		AC25kV/50Hz
Maximum Operating Speed		300 km/h
Number of Car per Car-Train (MT ratio)		12 cars (9M3T)
Passenger Capacity (for reference: estimate)		12-car train with 960 passengers
		Mono-class: 5-row seats All reversible reclining seats
Maximum Load Axle (with capacity passengers)		14 t or less
Car Principal Dimensions	Length (head/tail car)	26,500 mm
	(intermediate car)	25,000 mm
	Maximum Width	About 3,350 mm
	Maximum Height	3,700 mm

	Wheel Base	17,500 mm
Body Structure		Aluminum double-skin body structure (airtight body structure)
Bogie	Design	Bolsterless type
	Wheel Diameter	Φ=860 mm
	Wheelbase	2,500 mm
Main Circuit	Control System	VVVF inverter control system
		Three-level PWM control with IGBT's
	Main Motor	Induction motor: 300kW/unit or more
	Pantograph	2/car-train
		Single-arm low noise type
Brake System		Electric commanding air brake with regenerative brake
Traction and Braking Command Circuit		Digital transmission control and back-up commanding line
Protection System		Single-step continuous (pattern) control by ATC

According to the result of the demand forecasting, it is identified that the number of users for the Bandung Route is estimated as 57,000 persons/day in 2020 and 171,000 persons/day in 2050. For the Coastal Route, this will be 17,000 persons for 2020 and 40,000 persons for 2050 as shown in Table 4 These figures based on the number of users of conventional transportation means, the number of users to be converted to the high-speed railway is estimated by using the binary logit model.

Table 4 Demand forecasting [4]

Period	Bandung Route		Coastal Route
	Jakarta-Cirebon	Jakarta-Gedebage	Jakarta-Cirebon
2020	57,000	39,000	17,000
2050	171,000	127,000	40,000

The construction costs for rolling stock, land acquisition as well as other required costs for the project implementation costs in Jakarta-Cirebon section are estimated as JPY 726.4 billion for the Bandung Route and JPY 584.2 billion for the Coastal Route. Since the length of tunnel sections is long compared to the total length in the section of Jakarta-Bandung-Gedebage in the Bandung Route, the cost per km is relatively high. The project costs for each route is summarized in Table 5.

Table 5 Project costs [4]

Item	Bandung Route		Coastal Route
	Jakarta-Bandung -Cirebon	Jakarta-Bandung -Gedebage	Jakarta-Cirebon
Civil Engineering (Subgrade Course)	19,401	7,547	12,730
(Bridge)	118,717	90,537	197,216
(Tunnel)	174,955	110,286	54,234
Track Construction Cost	28,211	16,393	26,976
Station Construction Cost	17,200	11,100	11,100
Various Building Cost	4,174	3,340	3,372
Depot Machinery Cost	26,690	23,240	23,150
Power Line Cost	28,070	19,509	23,159
Communication Line Cost	10,101	6,545	8,187
Safety Equipment Cost	24,117	15,760	18,659
System Construction Cost	6,990	6,453	6,698
Train Track Cost	25,716	15,643	19,495
Substation Cost	54,342	38,879	40,863
Rolling Stock Cost	48,000	33,600	28,800
Total Construction Cost	586,684	398,832	474,639
Consulting Service Cost	29,334	19,942	23,732
Tax	61,602	41,877	49,837
Overhead Cost	2,933	1,994	2,373
Land Acquisition Cost	18,883	14,627	11,283
Contingency	26,934	18,262	22,292
Total Project Cost	726,370	495,534	584,156
Project Cost per km	2,837	3,427	2,818

(Unit: JPY million)

With estimation of the economic benefits (reduction of vehicle operating cost and travel time cost) by the project implementation, the Economic Internal Rate of Return (EIRR) is estimated as 13.6 % for the Bandung Route and a negative EIRR for the Coastal Route. These figures proved that the Bandung Route has an advantage over the Coastal Route and that the construction of the high-speed railway on the Bandung Route will be beneficial for the national economy. If the 1st stage construction on the Bandung Route is terminated in Gedebage where there is considerable demand for the railway, EIRR will increase further. Meanwhile, it is considered difficult for the private sector to construct the high-speed railway even for the Bandung Route by itself because of the low Financial Internal Rate of Return (FIRR). If the government provides 50 % of the initial investment which excludes the cost for rolling stock and station (11 % of total project cost) burdened by the private sector, FIRR will be around 8.5 % for both BOT and Concession Schemes. However, FIRR is improved into approximately 15 % for DBL Scheme. The above-mentioned findings have proven that the construction of the high-speed railway on the Bandung Route is

economically and financially feasible with certain financial support from the government. In accordance with the above examinations, the stage construction between Jakarta and Gedebage is the most preferable due to the high economic and financial feasibility and high demand. The results of economic and financial analysis are summarized in Table 6.

Table 6 Results of economic and financial analysis [4]

Index		Bandung Route		Coastal Route
		Jakarta-Bandung-Cirebon	Jakarta- Bandung-Gedebage	Jakarta-Cirebon
B/C		1.30	1.91	0.11
EIRR		13.6 %	16.2 %	Negative
ENPV (JPY million)		127,295	260,079	Negative
FIRR	BOT (AF 50%*)	8.5 %	8.6 %	4.9 %
	Concession (Gov-S 50%*)	8.4 %	8.6 %	2.3%
	DBL (LC 1.4 %)	15.5 %	15.8 %	Negative

BOT: Build-Operate-Transfer, AF: Availability Fee, Gov-S: Government Support
DBL: Design-Build-Lease, LC: Lease Cost
*Initial cost excluding rolling stock and station (11 % of total project cost) burdened by the private sector

3. China's Approach

In 2004 China's State Council adopted the Mid- and Long-Term Plan for railway development and the country decided to venture into the development of HSR. The government put in huge sums of money in subsequently years and, in 2008, it affirmed and upgraded the Plan. To help to speed up its HSR development, China began in 2004 to buy trains and rail technologies from foreign companies like Japan's Kawasaki, Germany's Siemens, France's Alstom and Canada's Bombardier. Based on foreign technologies and its own experiences of building trains in the past, China began in 2007 to develop its own HSR technology. On 1 August 2008 its first high-speed train started to run between Beijing and Tianjin, a week before the official opening of the Beijing Olympic Games. In 2009 China decided to 'go out' to promote its high-speed rail diplomacy, thus beginning a process of transitioning from goods 'made in China' to goods 'created in China' as a technology innovator and promotor. Domestically China plans to have four major train lines running in a north-south direction and another four lines running in an east-west direction across the whole country. Externally several major rail lines are being planned, one connecting Asia and Europe through Russia, another going through Central Asia and the Middle East to Europe, and a third linking southern China with Indo-China and Southeast Asia [5]. China's high-speed rail diplomacy has become part and parcel of its infrastructure diplomacy which, in turn, has formed the core programme of its 'one-belt, one road' initiative, its signature foreign policy. All these have happened just within the past decade or so [6]. The belt-and-road initiative was proposed by Chinese President Xi Jinping in late 2013. It is known officially as the 'Silk Road Economic Belt' and the '21st Century Maritime Silk Road'. The 'belt' or land component consists of many land routes and the 'road', the other

component, many sea routes. Both systems of land and sea routes connect China to Europe. To finance infrastructure projects under the belt-and-road initiative, China has taken the lead to set up the New (BRICS) Development Bank in 2013, the Asian Infrastructure Investment Bank in 2014, the Silk Road Fund in 2015, and many other financial instruments, both multilateral and bilateral [7]. Like many other countries or companies possessing advanced technologies, China will be foolhardy to short change its core technologies, for obvious commercial reasons, especially the design and development of the IGBT (insulated-gate bipolar transistor), which is regarded as the computer brain of the HSR train, controlling the directing of the communication signaling of the train system. Developing countries including Indonesia which desire to build their own high-speed rail system may not have the adequate domestic capacity to absorb such technology from the outside, whether from China or elsewhere, and turn it to their own advantage. China has a preference for exporting its train products in some form of wholesome package, from planning and installation to after-sales service and maintenance, from the main train products to associated engineering works such as bridge building and tunnel drilling. Some of the reasons are quite unique to China, such as those relating to demography, institutional settings, political supports and massive investments. Other countries may not have a large enough pool of engineers, technicians and scientists to learn, absorb and integrate incoming sources of knowledge. Many small or weak countries on their own may not have enough resources to finance costly projects such as high-speed railways.

4. History and Recent Development

Plans and studies have been in the works for high-speed rail (HSR) in Indonesia since before 2010 as mentioned previously. A new plan to build a HSR was announced by Indonesian government in July 2015. Indonesia's first – and possibly also Southeast Asia's first – high-speed rail project was expected to connect the national capital Jakarta with Bandung in neighboring West Java province, covering a distance of around 143 kilometers. Plans were also mentioned for a possible later extension of the HSR to Indonesia's second largest city, Surabaya in East Java. Both Japan and China had expressed their interest in the project. Previously, both countries had carried out comprehensive studies for a project for the Jakarta–Bandung section. Only the Japanese agency, JICA, had issued a study for a project extending to Surabaya (730 km). In April 2015, China submitted a bid for the Indonesian high-speed rail project – much to Japan’s dismay. On March 26, 2015, Joko Widodo visited Beijing and met Chinese president Xi Jinping. Xi publicly announced support for the Indonesian high-speed project and the two governments signed a memorandum specifying China's interest in the Jakarta–Bandung line. In July 2015, Indonesian government exposed their plan to build the high-speed rail connecting Jakarta and Bandung, and arranged a contest between Japan and China train-makers as potential bidders. China responded by launching a Chinese High-speed Rail Technology exhibition in Senayan City shopping mall in Jakarta in August 2015. Both China and Japan have engaged in a fierce competition through intense lobbying. It was said that the fundamental reason for the high level of assertiveness demonstrated by both Japan and China goes well beyond just economics – this

contest is part of a much larger chess game the two Asian powerhouses are playing in pursuit of greater strategic influence within the Asia Pacific. In mid-September 2015, China said they would fully meet the Indonesian government's demands and offering new proposal that does not require Indonesia to assume any fiscal burden or debt guarantee in proceeding with the project. After months of bids, revisions and talks among presidents and prime ministers – even a short-lived cancellation of the project – in late September 2015 Indonesia picked China for the US$5 billion project. It seems that Beijing has outmaneuvered Tokyo on this bid as a result of a competitive financing package for Indonesia. Japan's Chief Cabinet Secretary Yoshihide Suga termed the Indonesian move "difficult to understand" and "extremely regrettable". The situation "can only be described as extremely deplorable," Suga also said. According to Indonesia's State-Owned Enterprises Minister Rini Soemarno, Chinese bid was picked due to its financial structure – because the Chinese had not required any Indonesian government financing or a government guarantee, unlike the Japanese plan. China's victory over Japan in this bid seems to owe mainly to Chinese willingness to accept the financial risk of the project. Which is to forego an Indonesian government guarantee and also, thereby, possibly to finesse international ODA norms, in contrast of Japan's inability or unwillingness to do so. China has also sweetened its deal in other ways, including committing to establish a joint venture with Indonesian firms to produce rolling stock for high-speed rail, electric rail, light rail systems, not only for Indonesia, but also for export to other Asian countries – to transfer related technology – and to renovate and rebuild train stations. It seems that Indonesia has benefitted from Japan-China competition. The Indonesian HSR bid marked rivalry between Japan and China in their competition for Asian infrastructure projects. On late September 2015, Indonesia awarded the rail project to China, much to Japan's disappointment. It was said that China's offer to build the Jakarta–Bandung line without requiring an official loan guarantee nor funding from Indonesia was the tipping point of Jakarta's decision. In January 2016, Transportation Minister released a route permit for a high speed railway between Jakarta and Bandung with stations located at Halim (Jakarta end), Karawang, Walini, and Tegalluar (Bandung end) and also Tegalluar depot. As long as 71.63 km of the track will be at ground level, 53.54 km will be elevated, and 15.63 km will be underground. Groundbreaking has been done on January 21, 2016. The HSR is project of 60 percent of Indonesian consortium and 40 percent of China Railway International. The Jakarta–Bandung high-speed rail is planned to begin its operations to public in 2019.

5. Project's Description

The Jakarta-Bandung high-speed-rail project is part of President Joko Widodo's ambition to upgrade Indonesia's lagging infrastructure. If successful, the project will cut travel time between the two cities in western Java from about three hours by car to just 45 minutes. The high-speed rail will have four stations along its route (Figure 2).

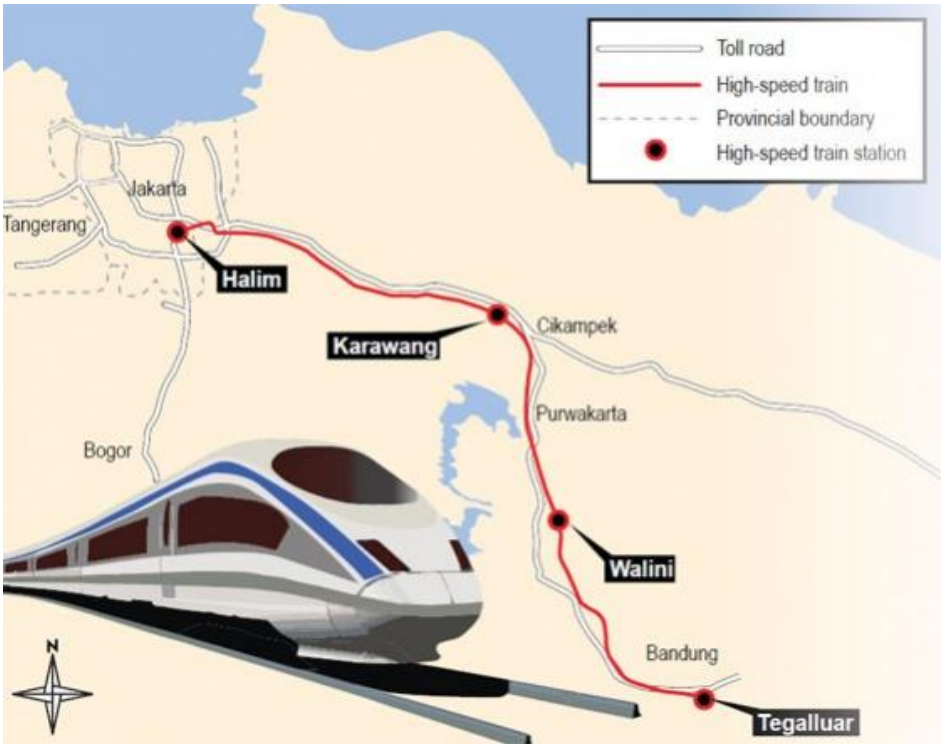

Figure 2 Route of Jakarta to Bandung high-speed rail

The HSR project will be financed through a Chinese loan, without aid from the Indonesian state budget. China Development Bank will provide approximately 75% of the funding, and the rest will be arranged by the joint venture partners. China Railway Construction Corp (CRCC) entered a joint venture with a consortium of Indonesia's state-owned enterprises (SOEs). The Indonesian consortium comprises PT Wijaya Karya, a construction company, railway operator PT Kereta Api Indonesia, toll-road builder PT Jasa Marga, and PT Perkebunan Nusantara VIII, a plantation company. The project will include integration of the HSR stations with developments along its corridor through transit oriented developments (TOD). Otherwise, even though the Jakarta and Bandung have the highest Indonesian population, it is dwarfed by most of European and Asian cities particularly in terms of population density near the rail station. Since high-speed railway requires high urban densities, particularly those concentrated close to major rail stations, extending high-speed railway to places without the ability to encourage high densities is unlikely to be successful [8].

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Table 7 Brief data of Jakarta to Bandung HSR [9]

Termini	Halim (Jakarta) ~ Tegalluar (Bandung)
Intermediate station	Karawang and Walini (West Java)
Route length	Approximately 143 km
Schedule train frequency	Every 35 min (first year operation)
Job opportunity	39,000 jobs-HSR construction
	20,000 jobs-TOD construction
	28,000-HSR and TOD operation
Payback period of investment	40.2 years-without TOD
	23.74 years-with TOD
Ticket price	IDR 225,000 (US$16)
Speed	Maximum operating speed 350 km/h
Estimated journey time	Between Halim and Tegalluar:45 min
Revenue from ticket sales	US$ 168 million (2020)
Commencement date	2020
Estimated completion date	2020
Passenger flow volume (2020)	About 29,000 passengers per day
Project costs	US$ 5.135 billion-without TOD
	US$ 5.294 billion-with TOD
Financial Internal Rate of Return (FIRR)	FIRR of project investment-before taxes= 4.87%-without TOD
	FIRR of project investment-before taxes= 6.85%-with TOD
	FIRR of project investment-after taxes= 4.05%-without TOD
	FIRR of project investment-after taxes= 5.64%- with TOD
	FIRR of capital-before taxes= 4.72%- without TOD
	FIRR of capital-before taxes= 11.19%- with TOD
	FIRR of capital-after taxes= 3.86%- without TOD
	FIRR of capital-after taxes= 9.29%- with TOD

The ambitious proposal for the national railway network comes amid recent news that the cost of the Jakarta-Bandung HSR has swelled to almost US$6 billion, from US$5.2 billion. On the other hand, rail ridership in Indonesia has risen substantially in recent years, making decades of underinvestment and growing urban congestion important considerations for transport stakeholders as they upgrade and construct new lines. Statistics Indonesia (BPS) reports that total rail passengers rose from 199.3 million in 2011 to 202.2 million in 2012, 216 million in 2013, 277.5 million in 2014 and 325.9 million in 2015. The average length of a passenger journey has simultaneously fallen from 95 km to 68 km, while the country's rail network remains limited to Java and Sumatra, with 22,296 km of total line operational in 2015. The Medium-Term Development Plan 2015-2019 includes an infrastructure development agenda that outlines projects such as having 3,258 km of newly built or rehabilitated rail lines, made up of 2,159 km of intercity railways and 1,099 km of urban railway, and boosting rail cargo volumes to 1.5 million twenty-foot equivalent units annually. Urban rail lines, including a planned light rail transit (LRT) system in Jakarta, are

also expected to help reduce congestion and transport costs, which have become the highest in South-east Asia. It was forecast that the new line would attract around 10 million passengers per year in first year of operation, although a few of these would only use part of the route. This high figure reflects the high population density of Jakarta, and the large number of origin destination pairs that the line would serve. In terms of expected annual demand growth for new HSR lines, aggregated traffic in Asia and Europe during the 1994 – 2004 period provides demand trends (Figure 3).

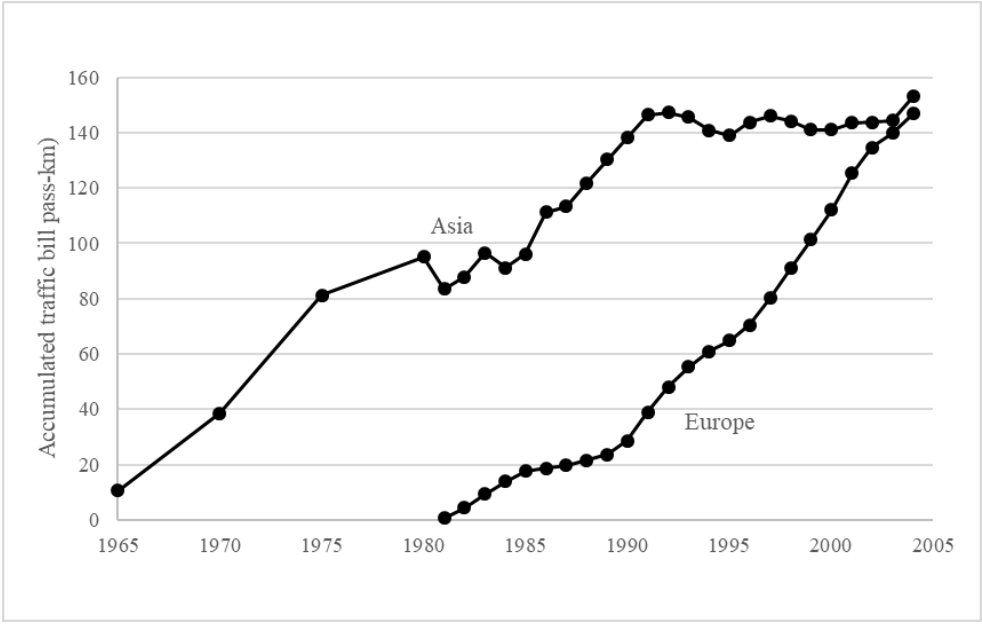

Figure 3 Accumulated HSR traffic [10]

Shinkansen services in Japan enjoyed a sustained traffic growth for the following 20-years, where during this period it gained around 100 billion passenger-km. However, in the next 20-years interval (from 1994 to 2004), accumulated demand growth halved, and only 50 billion additional passenger-km used HSR. By comparison, most European HSR projects are still in their first 20-year period, and therefore it is natural to expect high growth rates as expressed by Figure 3) at least until the HSR markets start to mature as in Japan. Graph 2 shows accumulated traffic used the HSR services in Asia and Europe based on traffic data from each operator during the 2010 to 2016 period. As confirmed by Figure 4 the only China is still in it incredible constant growth and gained a huge accumulated traffic around 850 billion passenger-km. Two other Asian countries i.e. South Korea and Taiwan started HSR services in first decade of 21 centuries only gained accumulated traffic of 31.4 and 20.2 billion passenger-km respectively during the same period. Based on long experienced of

HSR services in Japan and Europe countries it is easy to predict that most China HSR projects still enjoyed a constant traffic growth for the next two decades most triggering by combined building new dedicated electrified lines and upgrading existing lines. Both South Korea and Taiwan HSR service expressed constant demand growth for the following first decade even the Korea Train Express (KTX) has transported approximately 150 million passengers since the four years after its opening. Taiwan HSR itself has carried about 100,000 passengers per day for fifty first months of commercial service. However, Shinkansen services is still in its positive growth and gained accumulated traffic of 196 billion passenger-km from 2010 to 2016, two times higher than France figures of 99.1 billion passenger-km during the same period. It is important to note that France HSR experienced a stagnant traffic growth from 2010 to 2016; in 2016 as an example, SNCF collected accumulated traffic of 49.1 billion passenger-km, otherwise in 2010 it figure stand on 51.9 billion passenger-km. Other Europe HSR operators include Dutch, England, and Sweden indicated sustained traffic growth and collected accumulated traffic around 42 billion passenger-km until the end of 2016.

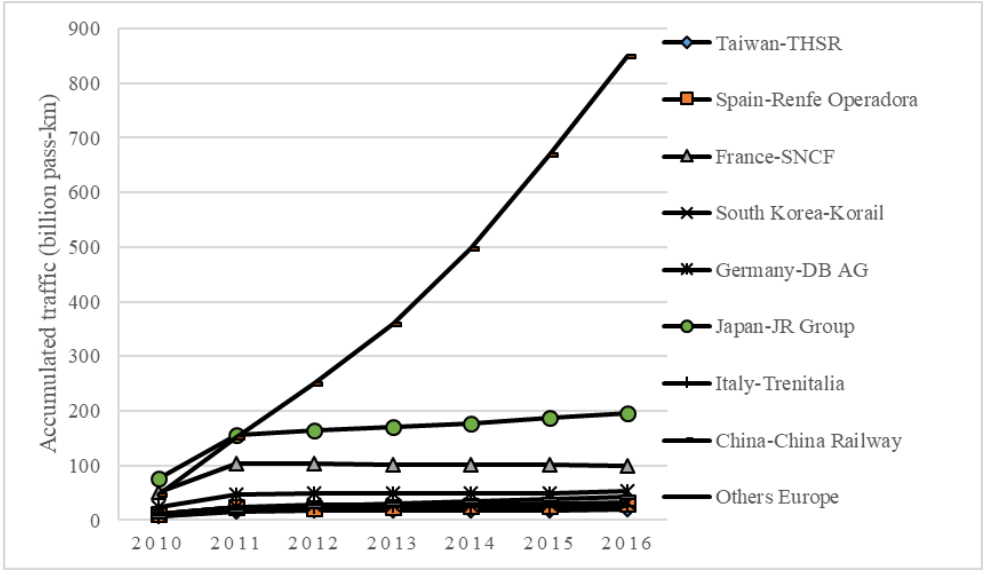

Figure 4 Accumulated HSR traffic [11]

Based on passenger traffic data from Europe and Asia, the first HSR line in Indonesia is expected to gain substantial amounts of demand. However, it is important to note that most Europe and Asian countries built HSR lines because their conventional lines were so successful that they needed to add a new capacity to increase rail service. Many of these lines already had double or triple tracking. Hence, the high demand for conventional rail created a market for HSR. It is inevitable to mention that Indonesia include Jakarta and

Bandung lacks of this factor that triggered HSR services successful in Europe and Asian countries.

6. Proposal of SG-KL HSR Project

In February 2013, the Malaysian and Singaporean governments agreed to build a high-speed rail line between Singapore and Kuala Lumpur by 2020 [12]. This project has been named a top priority in Malaysia's national development strategy, whose overall goal is to increase the country's economic power (e.g., one object is to increase GDP per person by 150 percent) by the time this HSR line will be built in 2020 and expecting for further boost in their economics by closely-tied cooperation with Singapore. The Malaysian government proposed to lead the project with the support of Singaporean government. In 2015, ASEAN will become a single market and production base with the establishment of the ASEAN Economic Community (AEC). ASEAN aims to enhance the competitiveness of its member countries, and for ASEAN to better integrate with the global economy [13]. Improved connectivity and better transport in the region are expected to help the initiative succeed. To that end, there are high hopes for expanded HSR in Asia, beginning with the Singapore-Kunming Link. The SG-KL line is a pilot for this long corridor and expected to improve passenger travel options for mid- and long distances in the region. Because ASEAN does not have legislative authority to force its members to participate, this pilot is expected to show any challenges that might occur in the near future with other examples within the organization. The HSR project will consist of double standard-gauge passenger dedicated tracks, will serve five stations, and will include express service directly between Singapore and Kuala Lumpur and transit service serving all stations on the route. From one of the stations passengers will be able to connect to a line to the Kuala Lumpur International Airport, and two or three of the other stations will connect with the existing trains serving its region or with the bus terminals [14]. The project cost has been estimated at RM 40 billion. (USD 12 billion). The source(s) of the funding, however, is not confirmed; some sources say Private-Public-Partnership (PPP) funding will be applied, while others say it will be co-funded by the Malaysian and Singaporean governments. Most of the line -335 km of it- will be in Malaysia, with the remaining 15 km in Singapore. The HSR will have eight stops - seven in Malaysia and one in Jurong East. The HSR line, with trains moving at a top speed of more than 300 kilometers an hour, was targeted to begin operating in 2026. It would've trimmed the land journey between Kuala Lumpur and Singapore to 90 minutes, from about five hours now (Figure 5). The project has attracted interest from many companies in Asia and Europe. While Korea Rail Network Authority and a group of South Korean companies won the reference design consultant contract, Chinese firms led by China Railway Signal & Communication Corp. and CRRC Corp., Siemens AG, Alstom SA and some Japanese conglomerates are among those in the race for the project. However, on Monday (May 28, 2018), Malaysian Prime Minister Mahathir Mohamad announced that the HSR project will be axed but noted that it will take some time because Malaysia and Singapore had signed a contract on the multi-billion-dollar project. Meanwhile, Dr Mahathir assured that the government will remain "business friendly" to all investors [15].

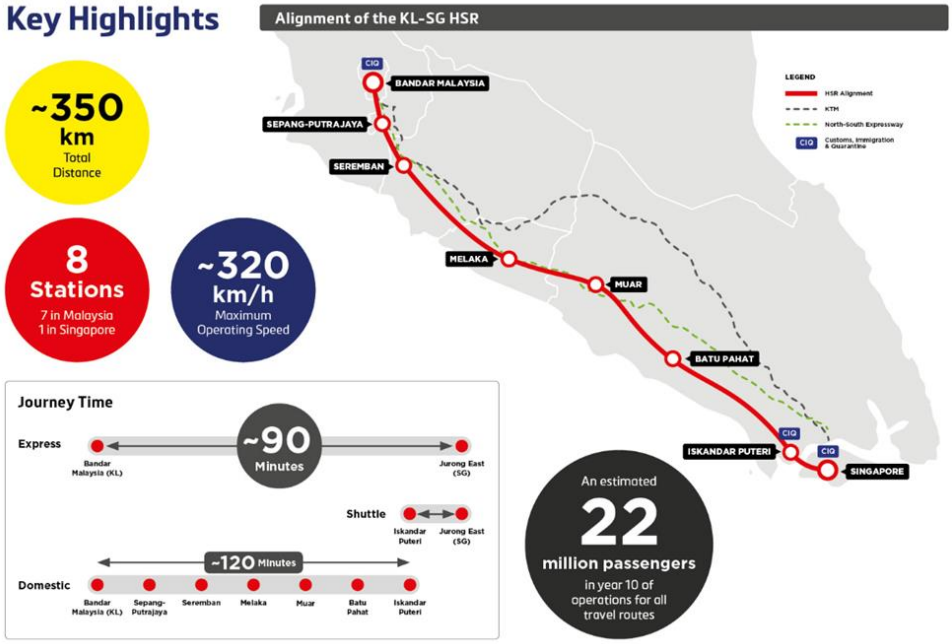

Figure 5 Proposed Kuala Lumpur – Singapore HSR line [16]

The relationship between Malaysia and Singapore is considered unique because of such factors as geography, economy, politics, history, culture, and ethnicity. Singapore separated from Malaysia in 1965. There is something of a rivalry between the countries; yet even though they have been characterized by competition in economic and social matters, they enjoy a very high level of economic interdependence as major trading partners (more than 10 percent of the total export Figures (57.1 billion SGD) are to Malaysia), and the geographical proximity of the two neighbors have made their security, economies, and prosperity inseparable [17]. Since 1965, the relationship between Singapore and Malaysia has been described as symbiotic. However, this mutually beneficial relationship has faced some challenges. The period from 1997 to 2002, when the Mahathir administration was in control in Malaysia, was said to be the most stressful in the history between Singapore and Malaysia. The situation changed after Abdullah Badawi became prime minister in 2003, and since then there has been enhanced contact and cooperation with Singapore. “It’s going to cost us a huge sum of money; we’ll make no money at all from this operation,” Mahathir told. “It’s only a short track. It is going to save you only one hour by taking the HSR” [15]. History is starting to repeat itself again in the part of the SG – KL HSR project.

Conclusions

The Jakarta-Bandung HSR project was carried out by PT Kereta Cepat Indonesia Cina (KCIC), a consortium of state-owned enterprises and China Railways through a business-to-business plan basis, with Indonesia having 60% interest in the joint venture, while China has 40%. China won the project due to its readiness to provide guarantee-free loans, while Japan requested Indonesian government funding. Japan was the first one interested in the project and started working on a feasibility study for a high speed rail track to link the capital to the country's second largest city, Surabaya, 730 kilometers east. In 2012, it started another feasibility study focused on the Jakarta-to-Bandung leg. The study was completed in 2014. With the highest operating speed of 350 km per hour, the Jakarta-Bandung high speed rail would shorten the travel time between the two hubs from three hours to 45 minutes and drive forward economic development along the line through transit oriented developments. It was forecast that the line would attract around 10 million passengers per year in first year of operation. This high figure reflects the high population density of Jakarta, and the large number of origin destination pairs that the line would serve.

The Kuala Lumpur-Singapore HSR is a strategic project between the Governments of Malaysia and Singapore that aims to facilitate seamless travel between the two capital cities, enhance business linkages, and connect the peoples of both countries closer together. The HSR link is expected to cut the travel time between the two cities from about four to five hours by road to 90 minutes. However, the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because it is going to cost a huge sum of money and will make no money at all from it because it is a short track.

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