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Dr. Aleksander Purba
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Subject: Acceptance of Full Paper and Invitation to the 9th International Conference on Geotechnique, Construction Materials and Environment, 20 to 22 November 2019, Tokyo, Japan

Dear Dr. Aleksander Purba,

We are pleased to inform you that after careful review and assessment, the members of the GEOMATE2019 Technical Committee have accepted your full paper entitled "The Challenge of Developing High-Speed Rail Projects: Recent Evidence from Developing Countries" for "Oral" presentation at the conference. It is, therefore, with great pleasure that we extend our formal invitation to you to participate and present your paper at this conference.

Please make sure you register before 15th August 2019 for your papers to be included in the conference proceedings and to be evaluated for GEOMAT2019 Awards. This is strictly necessary for logistics and smooth operation of the conference. We appreciate online registration using the following link:
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Should you require more information, please do not hesitate to contact us. We look forward to hearing from you soon. Please always refer paper ID number in any communication to us.

Sincerely yours,

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THE CHALLENGE OF DEVELOPING HIGH-SPEED RAIL PROJECTS: RECENT EVIDENCE FROM DEVELOPING COUNTRIES

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ABSTRACT

The plan by Indonesian government to build a high-speed rail (HSR) has previously existed for years. Both the Japanese and Chinese government had both showed interest in the project, and both of them have the technological capacity to build a railway that would connect Jakarta and Bandung. This project was however awarded to China because they made a provision of soft loans for the project, while Japan on the other hand wanted the Indonesian government to completely provide the fund required to execute the project from the beginning to the end of the project. The proposed construction of the railway lines will cut travel time between Jakarta and Bandung from about three hours by car to just 45 minutes only. The project will include integration of the HSR 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 is because of Jakarta's huge population size in addition to the number of pairs of destinations that the HSR would connect.

Keywords: High-speed rail, Indonesia, Travel time, Ridership, Transit oriented development

INTRODUCTION

A brief history into the railway system in Indonesia showed that the railway transport system was created in mid-19th century when Indonesia was still under the colonial rule of the Dutch. The railway system was created in 1939 so as to facilitate the movement of cargoes and passengers. As at that time, the length of the railway line was 6,324 km long on Java and 1,833 km long on the Sumatera Island. In 2009, the total railway length had fallen substantially from 6,324 km to 3,464 km on Java and 1,833km to 1,350 km on Sumatera Island [1]. The main reason for this decline was the competition of railway transport with road transport, thus more funds were utilized for building more roads at the expense of the railway lines. Hence, Law No. 23/2007 was approved to make railway transport an important means of transportation within Indonesia. This clearly maps out the development guide for the national railway system.

METHODOLOGY: CASE COMPARISONS

Author compare the proposed Jakarta-Bandung HSR corridor with the some of HSR corridors in Asia and Europe regions and to identify key factors that have contributed to its successful. International comparison is especially important in HSR because the research shows important differences across countries due to topography, demographics, nature of transit demand and government investment schemes [2, 3].

EARLY JAPANESE'S PROPOSAL

Japan had already indicated their interest to replicate their Shinkansen HSR technology in Indonesia since 2008. That same year, Japan had displayed their Shinkansen technology and also done a feasibility study. Considering that the Island of Java is identical to the pre-HSR Honshu in Japan, the Japanese government under the Japanese International Cooperation Agency (JICA) therefore proposed the construction of HSR for the Indonesian island of Java, backed by soft loans from the Japanese government, connecting the densely populated capital of Indonesia, Jakarta which suffers from freight and passenger congestion to Surabaya which is about 730 km apart.

A new proposal that focus on building 150 km of HSR from Jakarta to Bandung, which will result in the drastic reduction of the time spent to cover the 150 km from 3 hours to just 45 minutes as shown in Fig.1. Japan which is widely known for the manufacturing of world-class trains was the most favorable to win the contract for construction of HSR from Indonesian government. However, change in government after the 2014 Indonesian gubernatorial election which saw the swearing in of Joko Widodo in October 2014 put an end to this project. The Joko led administration basically the HSR project in January 2015, reason for this action was that the HSR project was quite too expensive for the government to execute and there were several other more important and significant infrastructural projects that were required in the underdeveloped islands outside of Java.

Fig. 1 Japanese proposed route [4]

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 proceeded to invest huge sums of money into this plan and, in 2008, it affirmed and upgraded the Plan. Part of China's strategy was the purchase of rail technologies developed countries. This helped to accelerate China's HSR development and led to the development of China's indigenous HSR technology in 2007. This culminated in the manufacture of China's first high-speed train on 1st August, 2008, China vigorously promoted its HSR technology, transitioning and positioning their HSR technology.

Internally, China plans to establish four major train lines, connecting the north to the south and another four lines connecting the east to the west, across the entire length and breadth of the whole country. Externally, several major rail lines are also being planned, one linking Asia and Europe via Russia, another connecting China to Europe via Central Asia and the Middle East, and a third connecting southern China with Indo-China and Southeast Asia [5]. China's HSR strategy has become part an integral belt-and-road strategy and core of China's foreign policy, all these have occurred just within the past decade or thereabout [6]. The 'belt' component comprises of many land routes and the 'road' component on the other hand comprises of many sea routes. This also arise from the fact that both systems of land and sea routes link China to Europe. This initiative also led to the development of special funding and investments [7].

HISTORY AND RECENT DEVELOPMENT

The HSR project was forecasted to cover a distance of about 143 km, linking Jakarta and Bandung, thus becoming Indonesia's first ever HSR project. As highlighted earlier, the Japanese and Chinese government made known their intention. Although the Japanese and Chinese governments had carried out previous comprehensive studies, it was only Japan that went the extra length of issuing a study for a project extending to Surabaya, which was estimate to be about 730 km. This was followed by a counter bid which was submitted by the Chinese government in April 2015, must to the chagrin of the Japanese.

This was followed by a state visit by Joko Widodo, who had a successful meeting with the Chinese president, Xi Jinping on March 26, 2015. After the meeting Xi Jinping publicly announced the support of the Chinese government for the development of Indonesian high-speed project, this was followed by the signing of a memorandum of understanding between the two governments. In July 2015, Indonesia led by Jodo Widodo officially announced their plan to commence the construction of the HSR, this would connect Jakarta and Bandung, the bidding process was then made public, therefore the contest was between the potential bidders which included both the Japanese and Chinese train-makers had. The contest became interesting as the Chinese train-maker organized a Chinese HSR Technology exhibition in August 2015. This was a brilliant move which was not new to either contenders since both the Chinese and Japanese have been engaged in fierce business competition in the past, often using intense lobbying to outdo each other. It was widely acclaimed that the primary reason behind the high display of domineering campaign displayed goes further.

The Chinese government played another card in mid-September 2015, they submitted a new proposal that offered to fully meet the Indonesian government's demands while also eliminating funding required to commence. This was followed closely by several months of bidding, negotiations, between the two countries. It temporarily led to the cancellation of the project, however, the Indonesian government made a decision to select China as the preferred bidder for the US$5 billion project because of its financial structure which was so hard to ignore, considering the fact that this was completely different from what the Japanese plan had proposed.

China's triumph can be alluded to China's willingness fund the project. This would in fact lead to a waiver, which was different from what the Japanese had offered, and the Japanese had also refused to shift their grounds. China had even gone further ahead alleviate its deal by including its commitment to institute a program for the manufacture of light and electric rail system in partnership with local businesses. These products would be targeted at the Indonesian market, and exported neighboring markets, thus creating a seamless technology transfer system that would lead to growth of local technology for renovating and train stations.

Therefore, it looked like Indonesia had benefitted immensely from the Japan-China competition, as the

Indonesian HSR bid earmarked continuous competition between Japan and China in their bid for other infrastructure projects with Asia. The HSR system has 71.63 km of the track on the ground level, while 53.54 km of the track will be raised, and the remaining 15.63 km will be below the surface. This was followed by the groundbreaking ceremony, held on January 21, 2016 to commence the construction of the HSR. The HSR system would be open to the public after its official launch in 2021.

PROJECT'S DESCRIPTION

The HSR is part of the governments' grand ambition of upgrading Indonesia's lagging infrastructure. If successful executed, the project will drastically reduce travel time to just 45 minutes only. The HSR has four stations as seen in Fig. 2.
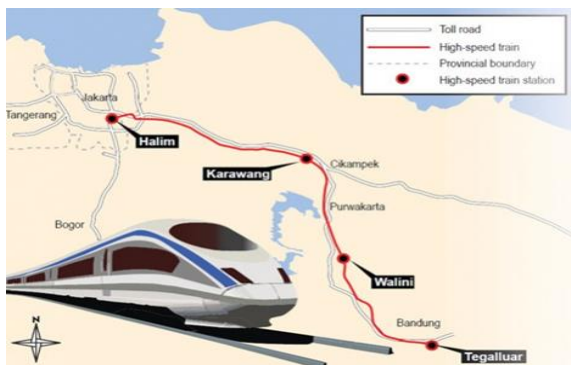

Fig. 2 Route of Jakarta to Bandung HSR

The HSR project will be financed exclusively by China. The project will include integration of the HSR stations with developments along its corridor through transit oriented developments (TOD) [8, 9].

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 million in 2011 to 202 million in 2012, 216 million in 2013, 277 million in 2014 and 325 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, as shown in Fig. 3.
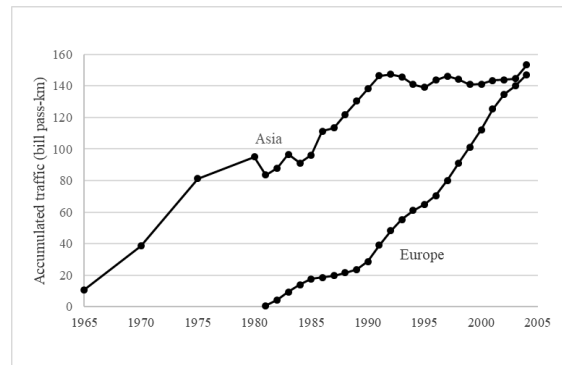

Fig. 3 Accumulated HSR traffic [10]

For 20 years, Shinkansen services in Japan enjoyed a sustained traffic, it gained 100 billion passengers-kilometer. From 1994 to 2004, within the next 20-years interval, the demand halved, because only 50 billion additional passengers-kilometer used HSR. When compared with most European HSR projects which are still in their first 20-year period, it is natural to expect high growth rates as expressed by Fig. 3. Figure 4 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 Fig. 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 billion passenger-km during the same period. France HSR had stagnant traffic growth from 2010 to 2016; in 2016 as an example, SNCF collected accumulated traffic of 49 billion passenger-km, otherwise in 2010 it figures stood at 51 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.
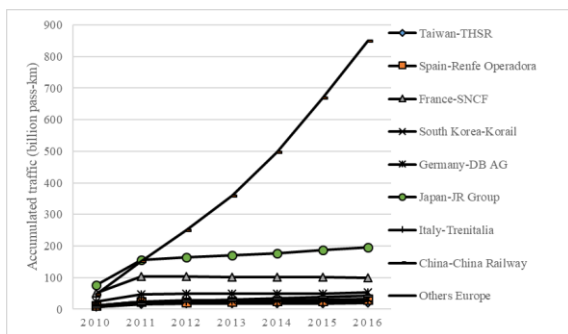

Fig. 4 Accumulated HSR traffic during the 2010 to 2016 period [11]

Based on passenger traffic data obtained from Europe and Asia, the first HSR line constructed in Indonesia is expected to gain considerable amounts of demand. However, it is important to state that in Europe and Asian countries, the construction of HSR lines was as a result of the inability of their conventional lines being unable to meet their demands, thus they needed to add a new capacity to increase rail service. It is also noteworthy to mention that many of these existing rail lines had already been doubled or tripled in a bid to increase the capacity. Therefore, the high demand for conventional rail can be said to have created a market for HSR in these countries. 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.

PROPOSAL OF SG-KL HSR PROJECT

The Malaysian and Singaporean governments signed an agreement on February 2013 that would result in the construction of HSR line, connecting Malaysia [12]. It is of utmost important and key to the successful implementation of Malaysia's national development strategy, (one of the main objective is to increase the country's GDP per person by 150%) by the time this HSR line will be completed in 2020, the Malaysian government is also looking forward to a further boost in the country's economics by closely-tied cooperation with the Singaporean government.

Cost of this project is estimated at RM 40 billion (USD 12 billion). The source(s) of the funding, however, has not been officially disclosed; although some private sources say that Private-Public-Partnership (PPP) funding will be used, others claim that it will be jointly co-funded by both the Malaysian and Singaporean governments considering the fact 335 km of the line will be in Malaysia while the remaining 15 km will be in Singapore. The HSR will have a total of eight stops, seven of which will be within Malaysia and one will be within Jurong East. The high speed rail line which will consist of bullet trains moving at top speed, above an estimated 300 km/hour is projected to become operational in 2026. This would therefore reduce the land journey between Kuala Lumpur and Singapore from about five hours to a mere 90 minutes' journey as shown in Fig. 5.

This project has attracted keen interest from various large corporations within Asia and Europe. However, Mahathir Mohamad who is the current Malaysian Prime Minister had announced on Monday May 28, 2018 that the HSR project will be axed, but he had also explained that it will take some time to execute because the Malaysian government and Singaporean government had also signed a contract on the multi-billion-dollar project. Meanwhile, Dr Mahathir Mohamad, the Malaysian Prime Minister had also assured that the government will remain "business friendly" to all investors involve in the project [13].
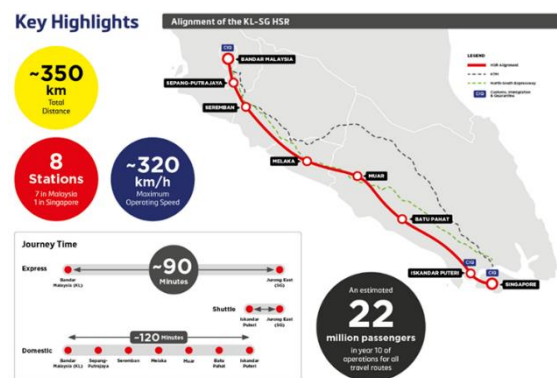

Fig. 5 Proposed Kuala Lumpur – Singapore HSR line [14]

The relationship existing between Malaysia and Singapore is considered unique because of certain factors, these include the geography of both countries, economy, politics, historical background, cultural

heritage, and ethnicity. It is also attributed to the fact that Singapore separated from Malaysia in 1965, hence the similarity. It is also intriguing to know that although both countries have been characterized by healthy competition in economic and social matters, they however enjoy a very high level of economic interdependence as major trading partners. The existing relationship between Singapore and Malaysia has been described as symbiotic. However, this mutually symbiotic as the relationship has been beneficial to both countries, although the relationship has faced some challenges in the past, it has existed since 1965. The Mahathir administration which was in control in Malaysia from 1997 to 2002, was believed by many to be the most stressful period between both Singapore and Malaysia. However, the situation changed after Abdullah Badawi got into power and became the prime minister of Malaysia in 2003, and since then there has been enhanced contact and cooperation between both governments. History is starting to repeat itself again in the part of the SG – KL HSR project [13].

CONCLUSIONS

In conclusion, the Jakarta-Bandung HSR project, linking Jakarta to Bandung was executed by PT Kereta Cepat Indonesia China (KCIC), through mutually agreed business-to-business plan basis, with the Indonesian government. China, which was not only the contender had been awarded the project because of the provision of soft loans for the project; on the other hand, Japan which had showed interest in the project had requested that the Indonesian government funded the project. Surprisingly, Japan was the first to have indicated interested in the project and had even gone ahead to commence working on a feasibility study for HSR track, connecting Jakarta to the country's second largest city, Surabaya, which is about 730 kilometers apart.

Indonesia went further in 2012 to commence another feasibility study focused on the Jakarta-to-Bandung leg, this study was finalized in 2014. The highest operating speed of the trains is estimated at about 350 km/hour, the Jakarta-Bandung high speed rail would result in shortened travel time between the two hubs, reducing the time spent to cover this distance from three hours to 45 minutes only, therefore pushing forward economic development along the line through transit oriented developments. It was projected that the line would also attract about 10 million passengers each year within the first year of operation. This high figure is however a reflection of the densely populated city of Jakarta, and the several number of origin destination pairs that the HSR line would simultaneously serve.

The Kuala Lumpur-Singapore HSR is a strategic project between the Malaysian government and Singaporean government, with its primary goal of facilitating seamless travel between the two capital cities of Kuala Lumpur and Singapore, enhancing business linkages, and connecting the citizens of both countries. The high-speed rail link is expected to reduce the travel time between the two cities from about four to five hours by road to 90 minutes only. However, it is also noteworthy to mention that the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because of its cost implications.

ACKNOWLEDGMENTS

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THE CHALLENGE OF DEVELOPING HIGH-SPEED RAIL PROJECTS: RECENT EVIDENCE FROM DEVELOPING COUNTRIES

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ABSTRACT: The plan by Indonesian government to build a high-speed rail (HSR) has previously existed for years. Both the Japanese and Chinese government had both showed interest in the project, and both of them have the technological capacity to build a railway that would connect Jakarta and Bandung. This project was however awarded to China because they made a provision of soft loans for the project, while Japan on the other hand wanted the Indonesian government to completely provide the fund required to execute the project from the beginning to the end of the project. The proposed construction of the railway lines will cut travel time between Jakarta and Bandung from about three hours by car to just 45 minutes only. The project will include integration of the HSR 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 is because of Jakarta's huge population size in addition to the number of pairs of destinations that the HSR would connect. However, even the KL – SG HSR project signed an agreement on February 2013, it is noteworthy to mention that the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because of its cost implications.

Keywords: High-speed rail, Indonesia, Travel time, Ridership, Transit oriented development

1. INTRODUCTION

A brief history into the railway system in Indonesia showed that the railway transport system was created in mid-19th century when Indonesia was still under the colonial rule of the Dutch. The railway system was created in 1939 so as to facilitate the movement of cargoes and passengers. As at that time, the length of the railway line was 6,324 km long on Java and 1,833 km long on the Sumatera Island. In 2009, the total railway length had fallen substantially from 6,324 km to 3,464 km on Java and 1,833km to 1,350 km on Sumatera Island [1]. The main reason for this decline was the competition of railway transport with road transport, thus more funds were utilized for building more roads at the expense of the railway lines. Hence, Law No. 23/2007 was approved to make railway transport an important means of transportation within Indonesia. This clearly maps out the development guide for the national railway system.

2. METHODOLOGY: CASE COMPARISONS

Author compare the proposed Jakarta-Bandung HSR corridor with the some of HSR corridors in Asia and Europe regions and to identify key factors that have contributed to its successful. International comparison is especially important in HSR because the research shows important differences across countries due to topography, demographics, nature of transit demand and government investment schemes [2, 3].

3. EARLY JAPANESE'S PROPOSAL

Japan had already indicated their interest to replicate their Shinkansen HSR technology in Indonesia since 2008. That same year, Japan had displayed their Shinkansen technology and also done a feasibility study. Considering that the Island of Java is identical to the pre-HSR Honshu in Japan, the Japanese government under the Japanese International Cooperation Agency (JICA) therefore proposed the construction of HSR for the Indonesian island of Java, backed by soft loans from the Japanese government, connecting the densely populated capital of Indonesia, Jakarta which suffers from freight and passenger congestion to Surabaya which is about 730 km apart. A new proposal that focus on building 150 km of HSR from Jakarta to Bandung, which will result in the drastic reduction of the time spent to cover the 150 km from 3 hours to just 45 minutes as shown in Fig.1. Japan which is widely known for the manufacturing of world-class trains was the most favorable to win the contract for construction of HSR from Indonesian government. However,

change in government after the 2014 Indonesian gubernatorial election which saw the swearing in of Joko Widodo in October 2014 put an end to this project. The Joko led administration basically the HSR project in January 2015, reason for this action was that the HSR project was quite too expensive for the government to execute and there were several other more important and significant infrastructural projects that were required in the underdeveloped islands outside of Java.

Fig.1 Japanese proposed route [4]

4. CHINA'S PROPOSAL

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 proceeded to invest huge sums of money into this plan and, in 2008, it affirmed and upgraded the Plan. Part of China's strategy was the purchase of rail technologies developed countries. This helped to accelerate China's HSR development and led to the development of China's indigenous HSR technology in 2007. This culminated in the manufacture of China's first high-speed train on 1st August, 2008, China vigorously promoted its HSR technology, transitioning and positioning their HSR technology. Internally, China plans to establish four major train lines, connecting the north to the south and another four lines connecting the east to the west, across the entire length and breadth of the whole country. Externally, several major rail lines are also being planned, one linking Asia and Europe via Russia, another connecting China to Europe via Central Asia and the Middle East, and a third connecting southern China with Indo-China and Southeast Asia [5]. China's HSR strategy has become part an integral belt-and-road strategy and core of China's foreign policy, all these have occurred just within the past decade or thereabout [6]. The 'belt' component comprises of many land routes and the 'road' component on the other hand comprises of many sea routes. This also arise from the fact that both systems of land and sea routes link China to Europe. This initiative also led to the development of special funding and investments [7].

5. HISTORY AND RECENT DEVELOPMENT

The HSR project was forecasted to cover a distance of about 143 km, linking Jakarta and Bandung, thus becoming Indonesia's first ever HSR project. As highlighted earlier, the Japanese and Chinese government made known their intention. Although the Japanese and Chinese governments had carried out previous comprehensive studies, it was only Japan that went the extra length of issuing a study for a project extending to Surabaya, which was estimate to be about 730 km. This was followed by a counter bid which was submitted by the Chinese government in April 2015, must to the chagrin of the Japanese. This was followed by a state visit by Joko Widodo, who had a successful meeting with the Chinese president, Xi Jinping on March 26, 2015. After the meeting Xi Jinping publicly announced the support of the Chinese government for the development of Indonesian high-speed project, this was followed by the signing of a memorandum of understanding between the two governments. In July 2015, Indonesia led by Jodo Widodo officially announced their plan to commence the construction of the HSR, this would connect Jakarta and Bandung, the bidding process was then made public, therefore the contest was between the potential bidders which included both the Japanese and Chinese train-makers had. The contest became interesting as the Chinese train-maker organized a Chinese HSR Technology exhibition in August 2015. This was a brilliant move which was not new to either contenders since both the Chinese and Japanese have been engaged in fierce business competition in the past, often using intense lobbying to outdo each other. It was widely acclaimed that the primary reason behind the high display of domineering campaign displayed goes further. The Chinese government played another card in mid-September 2015, they submitted a new proposal that offered to fully meet the Indonesian government's demands while also eliminating funding required to commence. This was followed closely by several months of bidding, negotiations, between the two countries. It temporarily led to the cancellation of the project, however, the Indonesian government made a decision to select China as the preferred bidder for the US$5 billion project because of its financial structure which was so hard to ignore, considering the fact that this was completely different from what the Japanese plan had proposed. China's triumph can be alluded to China's willingness fund the project. This would in fact lead to a waiver, which

was different from what the Japanese had offered, and the Japanese had also refused to shift their grounds. China had even gone further ahead alleviate its deal by including its commitment to institute a program for the manufacture of light and electric rail system in partnership with local businesses. These products would be targeted at the Indonesian market, and exported neighboring markets, thus creating a seamless technology transfer system that would lead to growth of local technology for renovating and train stations. Therefore, it looked like Indonesia had benefitted immensely from the Japan-China competition, as the Indonesian HSR bid earmarked continuous competition between Japan and China in their bid for other infrastructure projects with Asia. The HSR system has 71.63 km of the track on the ground level, while 53.54 km of the track will be raised, and the remaining 15.63 km will be below the surface. This was followed by the groundbreaking ceremony, held on January 21, 2016 to commence the construction of the HSR. The HSR system would be open to the public after its official launch in 2021.

6. PROJECT'S DESCRIPTION

The HSR is part of the governments' grand ambition of upgrading Indonesia's lagging infrastructure. If successful executed, the project will drastically reduce travel time to just 45 minutes only. The HSR has four stations as seen in Fig. 2. The HSR project will be financed exclusively by China. The project will include integration of the HSR stations with developments along its corridor through transit oriented developments (TOD) [8 - 10]. 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 million in 2011 to 202 million in 2012, 216 million in 2013, 277 million in 2014 and 325 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.
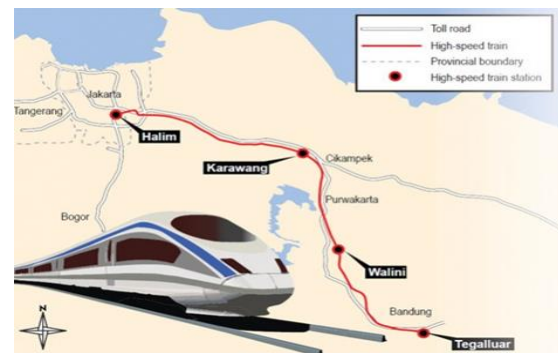

Fig. 2 Route of Jakarta to Bandung HSR

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, as shown in Fig. 3.
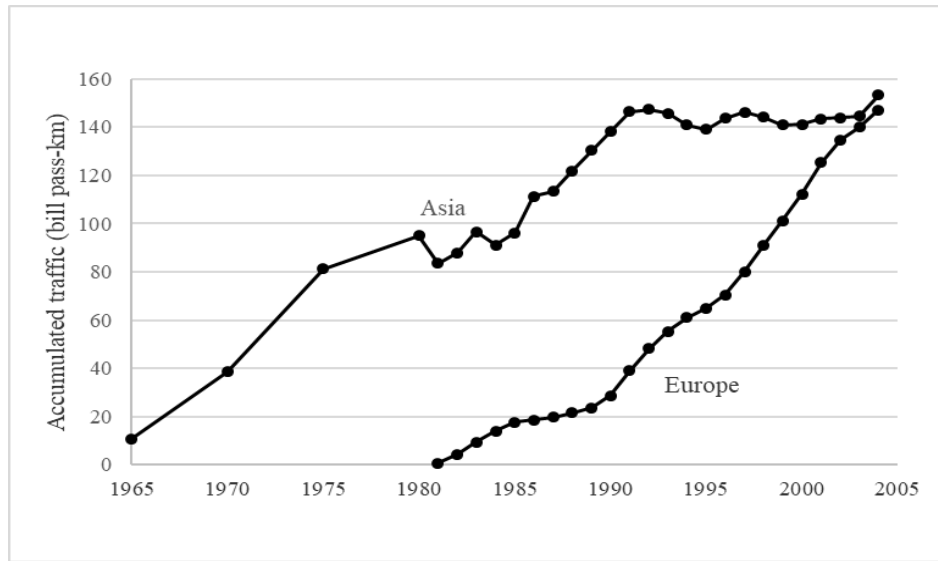
Fig. 3 Accumulated HSR traffic [11]

For 20 years, Shinkansen services in Japan enjoyed a sustained traffic, it gained 100 billion passengers-kilometer. From 1994 to 2004, within the next 20-years interval, the demand halved, because only 50 billion additional passengers-kilometer used HSR. When compared with most European HSR projects which are still in their first 20-year period, it is natural to expect high growth rates as expressed by Fig. 3. Hence, Fig. 4 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 Fig. 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 billion passenger-km during the same period. France HSR had stagnant

traffic growth from 2010 to 2016; in 2016 as an example, SNCF collected accumulated traffic of 49 billion passenger-km, otherwise in 2010 it figures stood at 51 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.

Table 1 Parahyangan statistics 2005 – 2016 [12]

Year	No. of passenger
2005	743,875
2006	529,725
2007	328,348
2008	610,662
2009	664,442
2010	592,434
2011	436,249
2012	439,003
2013	441,930
2014	406,361
2015	474,315
2016	560,320

Based on passenger traffic data obtained from Europe and Asia, the first HSR line constructed in Indonesia is expected to gain considerable amounts of demand. However, it is important to state that in Europe and Asian countries, the construction of HSR lines was as a result of the inability of their conventional lines being unable to meet their demands, thus they needed to add a new capacity to increase rail service. It is also noteworthy to mention that many of these existing rail lines had already been doubled or tripled in a bid to increase the capacity. Therefore, the high demand for conventional rail can be said to have created a

market for HSR in these countries. 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

as shown in the table above. The Parahyangan conventional line, which began operating in 1971 in the Jakarta – Bandung corridor only carries a total of 560,320 passengers in 2016.
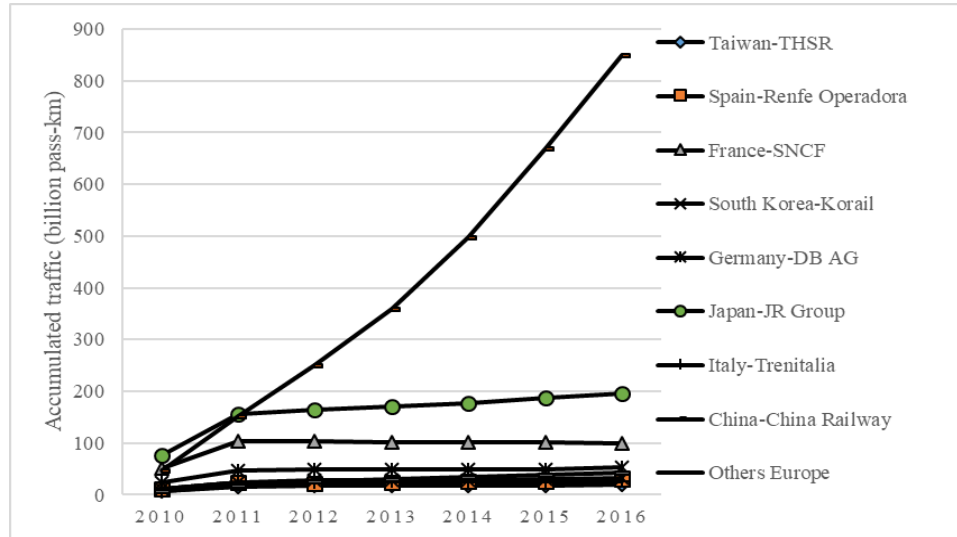

Fig. 4 Accumulated HSR traffic during the 2010 to 2016 period [13]

7. PROPOSAL OF SG – KL HSR PROJECT

The Malaysian and Singaporean governments signed an agreement on February 2013 that would result in the construction of HSR line, connecting Malaysia [14]. It is of utmost important and key to the successful implementation of Malaysia's national development strategy, (one of the main objective is to increase the country's GDP per person by 150%) by the time this HSR line will be completed in 2020, the Malaysian government is also looking forward to a further boost in the country's economics by closely-tied cooperation with the Singaporean government. Cost of this project is estimated at RM 40 billion (USD 12 billion). The source(s) of the funding, however, has not been officially disclosed; although some private sources say that Private-Public-Partnership (PPP) funding will be used, others claim that it will be jointly co-funded by both the Malaysian and Singaporean governments considering the fact 335 km of the line will be in Malaysia while the remaining 15 km will be in Singapore. The HSR will have a total of eight stops, seven of which will be within Malaysia and one will be within Jurong East. The high speed rail line which will consist of bullet trains moving at top speed, above an estimated 300 km/hour is projected to become operational in 2026. This would therefore reduce the land journey between Kuala Lumpur and Singapore from about five hours to a mere 90 minutes' journey as shown in Fig. 5. This project

has attracted keen interest from various large corporations within Asia and Europe. However, Mahathir Mohamad who is the current Malaysian Prime Minister had announced on Monday May 28, 2018 that the HSR project will be axed, but he had also explained that it will take some time to execute because the Malaysian government and Singaporean government had also signed a contract on the multi-billion-dollar project. Meanwhile, Dr Mahathir Mohamad, the Malaysian Prime Minister had also assured that the government will remain "business friendly" to all investors involve in the project [15]. The relationship existing between Malaysia and Singapore is considered unique because of certain factors, these include the geography of both countries, economy, politics, historical background, cultural heritage, and ethnicity. It is also attributed to the fact that Singapore separated from Malaysia in 1965, hence the similarity. It is also intriguing to know that although both countries have been characterized by healthy competition in economic and social matters, they however enjoy a very high level of economic interdependence as major trading partners. The existing relationship between Singapore and Malaysia has been described as symbiotic. However, this mutually symbiotic as the relationship has been beneficial to both countries, although the relationship has faced some challenges in the past, it has existed since 1965. The Mahathir administration which was in control in Malaysia from 1997 to 2002, was believed by many to be the most stressful period between both Singapore and

Malaysia. However, the situation changed after Abdullah Badawi got into power and became the prime minister of Malaysia in 2003, and since then there has been enhanced contact and cooperation between both governments. History is starting to repeat itself again in the part of the SG – KL HSR project [15].
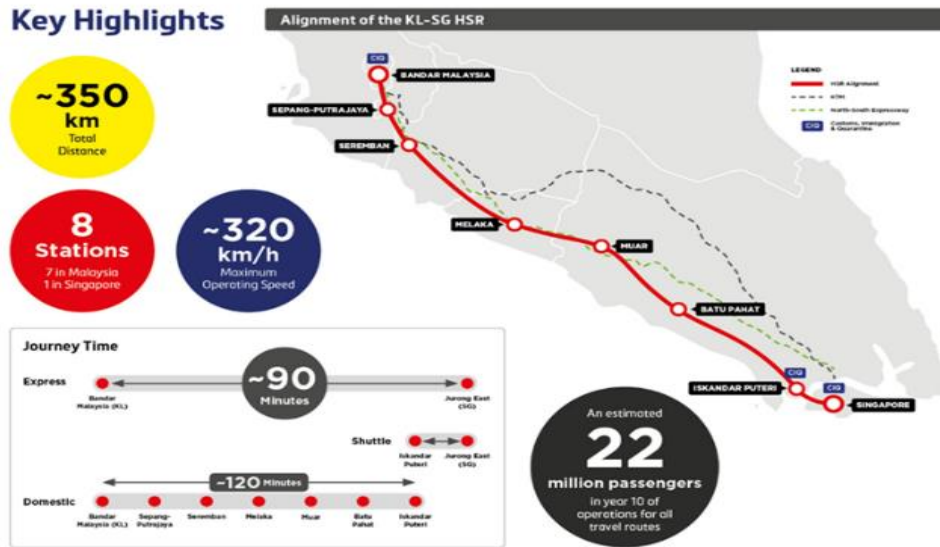

Fig. 5 Proposed Kuala Lumpur – Singapore HSR line [16]

8. CONCLUSIONS

In conclusion, the Jakarta-Bandung HSR project, linking Jakarta to Bandung was executed by PT Kereta Cepat Indonesia China (KCIC), through mutually agreed business-to-business plan basis, with the Indonesian government. China, which was not only the contender had been awarded the project because of the provision of soft loans for the project; on the other hand, Japan which had showed interest in the project had requested that the Indonesian government funded the project. Surprisingly, Japan was the first to have indicated interested in the project and had even gone ahead to commence working on a feasibility study for HSR track, connecting Jakarta to the country's second largest city, Surabaya, which is about 730 kilometers apart. Indonesia went further in 2012 to commence another feasibility study focused on the Jakarta-to-Bandung leg, this study was finalized in 2014. The highest operating speed of the trains is estimated at about 350 km/hour, the Jakarta-Bandung high speed rail would result in shortened travel time between the two hubs, reducing the time spent to cover this distance from three hours to 45 minutes only, therefore pushing forward economic development along the line through transit oriented developments. It was projected that the line would also attract about 10 million passengers each year within the first year of operation. This high figure is however a reflection of the densely populated city of Jakarta, and the several number of origin destination pairs that the HSR line would simultaneously serve. The Kuala Lumpur-Singapore HSR is a strategic project between the Malaysian government and Singaporean government, with its primary goal of facilitating seamless travel between the two capital cities of Kuala Lumpur and Singapore, enhancing business linkages, and connecting the citizens of both countries. The high-speed rail link is expected to reduce the travel time between the two cities from about four to five hours by road to 90 minutes only. However, it is also noteworthy to mention that the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because of its cost implications.

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THE CHALLENGE OF DEVELOPING HIGH-SPEED RAIL PROJECTS: RECENT EVIDENCE FROM DEVELOPING COUNTRIES

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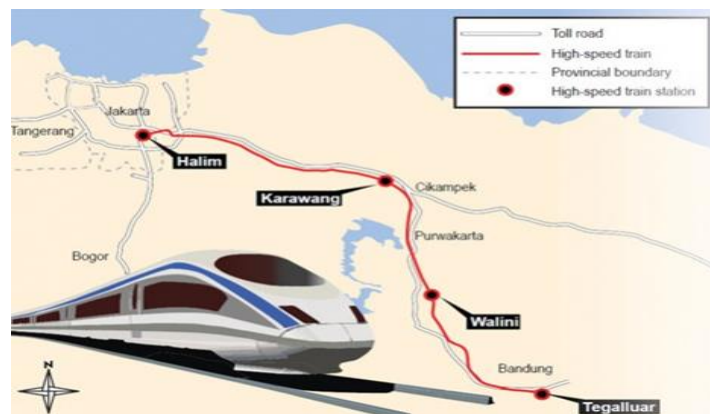

Fig. 2 Route of Jakarta to Bandung HSR

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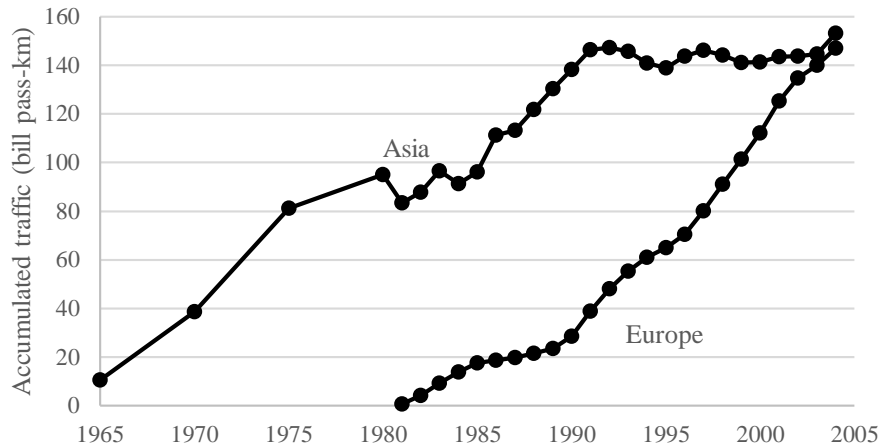

Fig. 3 Accumulated HSR traffic [11]

For 20 years, Shinkansen services in Japan enjoyed a sustained traffic, it gained 100 billion passengers-kilometer. From 1994 to 2004, within the next 20-years interval, the demand halved, because only 50 billion additional passengers-kilometer used HSR. When compared with most European HSR projects which are still in their first 20-year period, it is natural to expect high growth rates as expressed by Fig. 3. Hence, Fig. 4 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 Fig. 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,

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Table 1 Parahyangan statistics 2005 – 2016 [12]

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Based on passenger traffic data obtained from Europe and Asia, the first HSR line constructed in Indonesia is expected to gain considerable amounts

of demand. However, it is important to state that in Europe and Asian countries, the construction of HSR lines was as a result of the inability of their conventional lines being unable to meet their demands, thus they needed to add a new capacity to increase rail service. It is also noteworthy to mention that many of these existing rail lines had already been doubled or tripled in a bid to increase the capacity. Therefore, the high demand for conventional rail can be said to have created a market for HSR in these countries. 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 as shown in the table above. The Parahyangan conventional line, which began operating in 1971 in the Jakarta – Bandung corridor only carries a total of 560,320 passengers in 2016.

Fig. 4 Accumulated HSR traffic during the 2010 to 2016 period [13]

7. PROPOSAL OF SG – KL HSR PROJECT

The Malaysian and Singaporean governments signed an agreement on February 2013 that would result in the construction of HSR line, connecting Malaysia [14]. It is of utmost important and key to the successful implementation of Malaysia's national development strategy, (one of the main objective is to increase the country's GDP per person by 150%) by the time this HSR line will be completed in 2020, the Malaysian government is also looking forward to a further boost in the country's economics by closely-tied cooperation with the Singaporean government. Cost of this project is estimated at RM 40 billion (USD 12 billion). The source(s) of the funding, however, has not been officially disclosed; although some private sources say that Private-Public-Partnership (PPP) funding will be used, others claim that it will be jointly co-funded by both the Malaysian and Singaporean governments considering the fact 335 km of the line will be in Malaysia while the remaining 15 km will be in Singapore. The HSR will have a total of eight stops, seven of which will be within Malaysia and one will be within Jurong East. The high speed rail line which will consist of

bullet trains moving at top speed, above an estimated 300 km/hour is projected to become operational in 2026. This would therefore reduce the land journey between Kuala Lumpur and Singapore from about five hours to a mere 90 minutes' journey as shown in Fig. 5. This project has attracted keen interest from various large corporations within Asia and Europe. However, Mahathir Mohamad who is the current Malaysian Prime Minister had announced on Monday May 28, 2018 that the HSR project will be axed, but he had also explained that it will take some time to execute because the Malaysian government and Singaporean government had also signed a contract on the multi-billion-dollar project. Meanwhile, Dr Mahathir Mohamad, the Malaysian Prime Minister had also assured that the government will remain "business friendly" to all investors involve in the project [15]. The relationship existing between Malaysia and Singapore is considered unique because of certain factors, these include the geography of both countries, economy, politics, historical background, cultural heritage, and ethnicity. It is also attributed to the fact that Singapore separated from Malaysia in 1965, hence the similarity. It is also intriguing to know that although both countries have been characterized by

healthy competition in economic and social matters, they however enjoy a very high level of economic interdependence as major trading partners. The existing relationship between Singapore and Malaysia has been described as symbiotic. However, this mutually symbiotic as the relationship has been beneficial to both countries, although the relationship has faced some challenges in the past, it has existed since 1965. The Mahathir administration which was in control in Malaysia from 1997 to 2002, was believed by many to be the most stressful period between both Singapore and Malaysia. However, the situation changed after Abdullah Badawi got into power and became the prime minister of Malaysia in 2003, and since then there has been enhanced contact and cooperation between both governments. History is starting to repeat itself again in the part of the SG – KL HSR project [15].
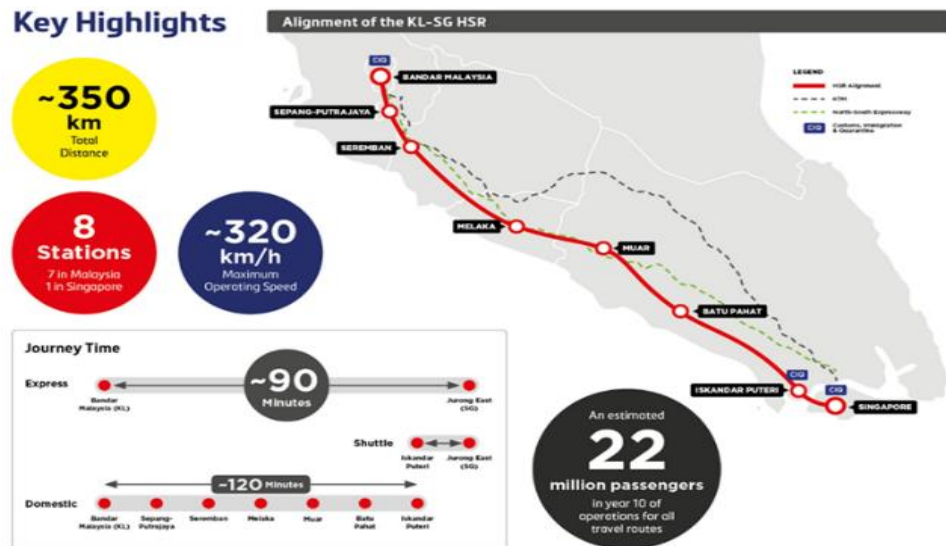

Fig. 5 Proposed Kuala Lumpur – Singapore HSR line [16]

8. CONCLUSIONS

In conclusion, the Jakarta-Bandung HSR project, linking Jakarta to Bandung was executed by PT Kereta Cepat Indonesia China (KCIC), through mutually agreed business-to-business plan basis, with the Indonesian government. China, which was not only the contender had been awarded the project because of the provision of soft loans for the project; on the other hand, Japan which had showed interest in the project had requested that the Indonesian government funded the project. Surprisingly, Japan was the first to have indicated interested in the project and had even gone ahead to commence working on a feasibility study for HSR track, connecting Jakarta to the country's second largest city, Surabaya, which is about 730 kilometers apart. Indonesia went further in 2012 to commence another feasibility study focused on the Jakarta-to-Bandung leg, this study was finalized in 2014. The highest operating speed of the trains is estimated at about 350 km/hour, the Jakarta-Bandung high speed rail would result in shortened travel time between the two hubs, reducing the time spent to cover this distance from three hours to 45 minutes only, therefore pushing forward economic development along the line through transit oriented developments. It was projected that the line would also attract about 10 million passengers each year within the first year of operation. This high figure is however a reflection of the densely populated city of Jakarta, and the several number of origin destination pairs that the HSR line would simultaneously serve. The Kuala Lumpur-Singapore HSR is a strategic project between the Malaysian government and Singaporean government, with its primary goal of facilitating seamless travel between the two capital cities of Kuala Lumpur and Singapore, enhancing business linkages, and connecting the citizens of both countries. The high-speed rail link is expected to reduce the travel time between the two cities from about four to five hours by road to 90 minutes only. However, it is also noteworthy to mention that the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because of its cost implications.

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Tambahan Data (Revisi-2)

Moda transportasi kereta api semakin mendapat tempat di hati masyarakat seiring dengan peningkatan pelayanan di setiap sektor. Hal ini terbukti dengan meningkatnya volume penumpang kereta api dari tahun ke tahun. Pada 2016, KAI mengangkut 352,3 juta penumpang. Di tahun 2017, jumlahnya naik 12% menjadi 394,1 juta penumpang. Lonjakan penumpang berlanjut di tahun 2018 dengan jumlah total 425 juta penumpang atau naik 8%.

Sampai dengan Semester I 2019 terjadi peningkatan sebesar 2% dibandingkan dengan periode yang sama di tahun sebelumnya. Pada Semester I 2019 PT Kereta Api Indonesia (Persero) melayani 210,7 juta penumpang. Sedangkan di Semester I 2018, KAI melayani 207 juta penumpang.

Sumber: https://kai.id/information/full_news/2650-peningkatan-volume-penumpang-kereta-api-bukti-kepercayaan-masyarakat-kepada-kai

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THE CHALLENGE OF DEVELOPING HIGH-SPEED RAIL PROJECTS: RECENT EVIDENCE FROM DEVELOPING COUNTRIES

*Aleksander Purba[1]

[1]Engineering Faculty, University of Lampung, Lampung, Indonesia

ABSTRACT: The plan by Indonesian government to build a high-speed rail (HSR) has previously existed for years. Both the Japanese and Chinese government had both showed interest in the project, and both of them have the technological capacity to build a railway that would connect Jakarta and Bandung. This project was however awarded to China because they made a provision of soft loans for the project, while Japan on the other hand wanted the Indonesian government to completely provide the fund required to execute the project from the beginning to the end of the project. The proposed construction of the railway lines will cut travel time between Jakarta and Bandung from about three hours by car to just 45 minutes only. The project will include integration of the HSR 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 is because of Jakarta's huge population size in addition to the number of pairs of destinations that the HSR would connect. However, even the KL – SG HSR project signed an agreement on February 2013, it is noteworthy to mention that the surprising decision arrived not long after the newly elected Malaysian prime minister raised the possibility of dropping the project because of its cost implications.

Keywords: High-speed rail, Indonesia, Travel time, Ridership, Transit oriented development

1. INTRODUCTION

A brief history into the railway system in Indonesia showed that the railway transport system was created in mid-19th century when Indonesia was still under the colonial rule of the Dutch. The railway system was created in 1939 so as to facilitate the movement of cargoes and passengers. As at that time, the length of the railway line was 6,324 km long on Java and 1,833 km long on the Sumatera Island. In 2009, the total railway length had fallen substantially from 6,324 km to 3,464 km on Java and 1,833km to 1,350 km on Sumatera Island [1]. The main reason for this decline was the competition of railway transport with road transport, thus more funds were utilized for building more roads at the expense of the railway lines. Hence, Law No. 23/2007 was approved to make railway transport an important means of transportation within Indonesia. This clearly maps out the development guide for the national railway system.

2. METHODOLOGY: CASE COMPARISONS

Author compare the proposed Jakarta-Bandung HSR corridor with the some of HSR corridors in Asia and Europe regions and to identify key factors that have contributed to its successful. International comparison is especially important in HSR because the research shows important differences across countries due to topography, demographics, nature of transit demand and government investment schemes [2, 3].

3. EARLY JAPANESE'S PROPOSAL

Japan had already indicated their interest to replicate their Shinkansen HSR technology in Indonesia since 2008. That same year, Japan had displayed their Shinkansen technology and also done a feasibility study. Considering that the Island of Java is identical to the pre-HSR Honshu in Japan, the Japanese government under the Japanese International Cooperation Agency (JICA) therefore proposed the construction of HSR for the Indonesian island of Java, backed by soft loans from the Japanese government, connecting the densely populated capital of Indonesia, Jakarta which suffers from freight and passenger congestion to Surabaya which is about 730 km apart. A new proposal that focus on building 150 km of HSR from Jakarta to Bandung, which will result in the drastic reduction of the time spent to cover the 150 km from 3 hours to just 45 minutes as shown in Fig.1. Japan which is widely known for the manufacturing of world-class trains was the most favorable to win the contract for construction of HSR from Indonesian government. However,

change in government after the 2014 Indonesian gubernatorial election which saw the swearing in of Joko Widodo in October 2014 put an end to this project. The Joko led administration basically the HSR project in January 2015, reason for this action was that the HSR project was quite too expensive

for the government to execute and there were several other more important and significant infrastructural projects that were required in the underdeveloped islands outside of Java.

Fig.1 Japanese proposed route [4]

4. CHINA'S PROPOSAL

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 proceeded to invest huge sums of money into this plan and, in 2008, it affirmed and upgraded the Plan. Part of China's strategy was the purchase of rail technologies developed countries. This helped to accelerate China's HSR development and led to the development of China's indigenous HSR technology in 2007. This culminated in the manufacture of China's first high-speed train on 1st August, 2008, China vigorously promoted its HSR technology, transitioning and positioning their HSR technology. Internally, China plans to establish four major train lines, connecting the north to the south and another four lines connecting the east to the west, across the entire length and breadth of the whole country. Externally, several major rail lines are also being planned, one linking Asia and Europe via Russia, another connecting China to Europe via Central Asia and the Middle East, and a third connecting southern China with Indo-China and Southeast Asia [5]. China's HSR strategy has become part an integral belt-and-road strategy and core of China's foreign policy, all these have occurred just within the past decade or thereabout [6]. The 'belt' component comprises of many land routes and the 'road' component on the other hand comprises of many sea routes. This also arise from

the fact that both systems of land and sea routes link China to Europe. This initiative also led to the development of special funding and investments [7].

5. HISTORY AND RECENT DEVELOPMENT

The HSR project was forecasted to cover a distance of about 143 km, linking Jakarta and Bandung, thus becoming Indonesia's first ever HSR project. As highlighted earlier, the Japanese and Chinese government made known their intention. Although the Japanese and Chinese governments had carried out previous comprehensive studies, it was only Japan that went the extra length of issuing a study for a project extending to Surabaya, which was estimate to be about 730 km. This was followed by a counter bid which was submitted by the Chinese government in April 2015, must to the chagrin of the Japanese. This was followed by a state visit by Joko Widodo, who had a successful meeting with the Chinese president, Xi Jinping on March 26, 2015. After the meeting Xi Jinping publicly announced the support of the Chinese government for the development of Indonesian high-speed project, this was followed by the signing of a memorandum of understanding between the two governments. In July 2015, Indonesia led by Jodo Widodo officially announced their plan to commence the construction of the HSR, this would connect Jakarta and Bandung, the bidding process was then made public, therefore the contest was between the potential bidders which included both

the Japanese and Chinese train-makers had. The contest became interesting as the Chinese train-maker organized a Chinese HSR Technology exhibition in August 2015. This was a brilliant move which was not new to either contenders since both the Chinese and Japanese have been engaged in fierce business competition in the past, often using intense lobbying to outdo each other. It was widely acclaimed that the primary reason behind the high display of domineering campaign displayed goes further. The Chinese government played another card in mid-September 2015, they submitted a new proposal that offered to fully meet the Indonesian government's demands while also eliminating funding required to commence. This was followed closely by several months of bidding, negotiations, between the two countries. It temporarily led to the cancellation of the project, however, the Indonesian government made a decision to select China as the preferred bidder for the US$5 billion project because of its financial structure which was so hard to ignore, considering the fact that this was completely different from what the Japanese plan had proposed. China's triumph can be alluded to China's willingness fund the project. This would in fact lead to a waiver, which was different from what the Japanese had offered, and the Japanese had also refused to shift their grounds. China had even gone further ahead alleviate its deal by including its commitment to institute a program for the manufacture of light and electric rail system in partnership with local businesses. These products would be targeted at the Indonesian market, and exported neighboring markets, thus creating a seamless technology transfer system that would lead to growth of local technology for renovating and train stations. Therefore, it looked like Indonesia had benefitted immensely from the Japan-China competition, as the Indonesian HSR bid earmarked continuous competition between Japan and China in their bid for other infrastructure projects with Asia. The HSR system has 71.63 km of the track on the ground

level, while 53.54 km of the track will be raised, and the remaining 15.63 km will be below the surface. This was followed by the groundbreaking ceremony, held on January 21, 2016 to commence the construction of the HSR. The HSR system would be open to the public after its official launch in 2021.

6. PROJECT'S DESCRIPTION

The HSR is part of the governments' grand ambition of upgrading Indonesia's lagging infrastructure. If successful executed, the project will drastically reduce travel time to just 45 minutes only. The HSR has four stations as seen in Fig. 2. The HSR project will be financed exclusively by China. The project will include integration of the HSR stations with developments along its corridor through transit oriented developments (TOD) [8 - 10]. 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 million in 2011 to 202 million in 2012, 216 million in 2013, 277 million in 2014 and 325 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.

Fig. 2 Route of Jakarta to Bandung HSR [11]

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, as shown in Fig. 3.
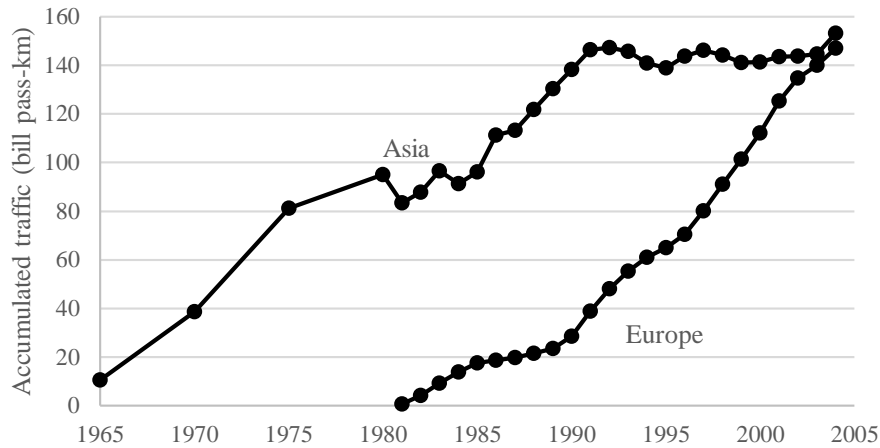

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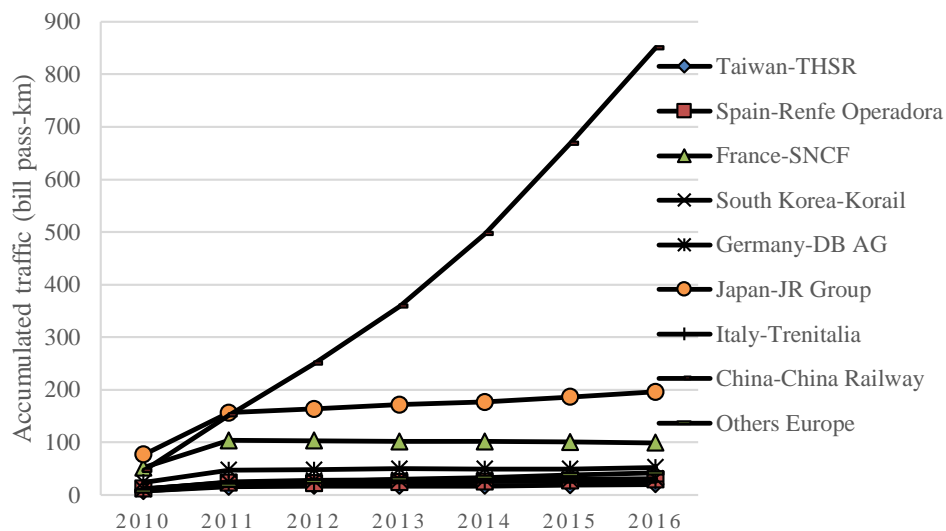

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