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An Assessment of Economic and Financial Impacts of Jakarta-Bandung High-Speed Railway Project

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Abstract

In this paper, we assess the economic and financial impacts of the proposed Jakarta-Bandung high speed railway project. Our assessment following Zou et. al. (2018) suggests that, over the long run, the project may increase the combined income of Jakarta, the neighbouring province Karawang and the country's major industrial centre Bandung, by an estimated 12-18%, by increasing 'market access', by the firms in the region, under several assumptions. We estimated that the project will increase Indonesian real GDP by almost 0.4%, mostly during its construction phase, with certain assumptions on the returns to capital. On the other hand, although the project is expected to generate over 40,000 jobs in Indonesia, according to several sources, the project may entail an immediate loss of over 2,000 traditional jobs around the track. In addition, Transit Oriented Development plans, such as tourist spot in Walini, residential complex around the project site etc. are likely to affect community farming and water supply in the region. Therefore, we assessed that, the success of the project is subjected to several legal and institutional barriers including ongoing issues related to the land acquisition. The sluggish progress of the project exerts financial risk to the stakeholders, especially since the project has no 'guarantee' from the Indonesian government. We estimated that, the China Development Bank, as a majority fundraiser, bears significantly large portion of the risk than the other stakeholders in the project. The financial risks faced by the Indonesian counterpart, on the other hand, is significantly lower.

Key words : *High-speed rail, market access, economic growth, risks***, JEL: O: F6**

1. Introduction

Jakarta-Bandung High-Speed Railway Project (HSRP) is a proposed high-speed passenger railway project connecting Indonesia's capital Jakarta with Bandung, one of the major industrial hubs in Indonesia. The project is claimed as the first of its kind in South-East Asia, covering approximately 140 km between the two cities, connecting through Karawang and Walini; the major upcoming residential and tourism hubs in Indonesia, respectively. As an outcome of this project, which would cost about $5.9 bn, as on May 2018, the commutation time between Jakarta and Bandung is expected to be reduced to about 40 minutes, from the current 3-4 hours with usual traffic. In this paper, we address two aspects related to the project. First, we summarise the major risks to the project's expected outcomes and also its progress. Second, we assess the economic and financial impacts of this project. By economic impacts, we refer to the project's outcome in terms of Indonesia's regional gross domestic product (GDP). The financial impacts, on the other hand, summarise the expected changes in the balance sheet of the stakeholders and governments, in case of materialisation of the risks.

The selection of Jakarta-Bandung High Speed Railway Project for our paper is significant for several reasons. This project, first of its kind in South-east Asia, is also the first business-to-business investment involving Chinese firms in Indonesia. Despite being promising to Indonesia's main island's transportation system and the associated Transit Oriented Development (TOD) plan in Walini (Berawi et. al., (2017), Jahja (2016)) it has drawn significant attention in the international policy debates and academia, because of the heavy involvement of Chinese stakeholders (Negara and Suryadinata, 2018). This project marks a landmark shift in the focus from Japan as partner in Indonesia's infrastructure projects, to China. China's agreement for '*no government guarantee*' from Indonesia as opposed to Japan's bid for a '*guarantee*' has been cited as the predominant reason why Indonesia awarded this project to China instead of Japan. The absence of government guarantee certainly heightens the stakeholders' exposure to financial risks. Although there is no direct government guarantee, the presence of several state-owned enterprises from both China and Indonesia constitute significant contingent liability for both the governments. Standing issues on land acquisition and community farming also jeopardise success of the project. From the perspective of public policy, the importance of understanding the risks and evaluating the benefits of such strategic projects are beyond any doubt. The study not only provides a snapshot of the current state of the project, but also highlights some of the potential gaps in the project's design which may be carefully avoided with appropriate policy.

The paper is divided into the following sections. After the brief introduction in this Section, we provide a sketch of the stakeholder structure and financing responsibility for this project in Section III. In section IV, we outline several impending risks which might challenge the desired outcomes from the project. In Section V, we provide our assessment of the macroeconomic and financial impacts of the project. In section VI, we conclude.

2. Methodology

In this paper, we provide some estimates for the potential gains in the combined 'market access' by the existing producers and the consumers due to the HSR, which connects several regencies in Java island. Our estimation is based on the methodology of Zou, et. al. (2018), under the reasonable assumptions on transportation cost and time in Indonesian case. Our estimates make a plausible guess only of the project's 'direct' impacts on the region's aggregate 'market access' and GDP, under the assumption that a faster and efficient HSR reduces the 'iceberg trade cost'. The 'indirect' or the spill-over effects which include increase in property prices, urban agglomeration etc. are beyond the scope of this paper due to the lack of evidence at this moment, as the project is merely in its planning phase. Also, in this paper, we do not explicitly analyse the likely social costs and benefits, which may emanate from the environmental considerations, labour migration, inequality, changing job patterns in the region etc. The assessment of social cost and benefits is limited due to the non-availability of evidence for this project, which is yet to be completed and operationalised. Also, the most important assumption in our estimation is that, the railway be utilised for industrial cargo shipment in the long run, although it is limited to only passenger movement in its current plan. In other words, our estimates may be taken as a measure of potential gain in the long run.

3. Disscussion

a. Stakeholder structure and financing responsibility

In the management of Jakarta-Bandung high-speed rail project, the joint venture called PT-KCIC plays a role as special purpose vehicle (SPV) to coordinate relevant stakeholders and ensure the project works smoothly. Being responsible for financing, construction, daily operation, maintenance activities, etc. PT-KCIC is consisted of both Chinese and Indonesian consortiums, where Indonesia's consortium (PT PSBI) owns 60% of shareholdings. For Indonesian side, PT PSBI is formed by four Indonesian SOEs—Wika, KAI, PTP and PT Jasa Marga with different proportion of share, which are specialised in different fields of railway constructions, railway operations, plantation and toll road operations. For Chinese side, Beijing Yawan High Speed Railway Co., Ltd is set up especially for this project, consisting of five big SOEs in relevant areas, like railway construction, operation and so on.

Just like the operator of this project, the contractor is also a consortium of Chinese and Indonesian corporations, called High Speed Railway Construction Consortium (HSRCC). On April 2017, PT-KCIC signed an Engineering Procurement Construction (EPC) contract with HSRCC to speed up the construction. Among which, Wika is responsible for "structural, architectural, landscape, mechanical and electrical works" (The Jakarta Post, May 2, 2018); meanwhile CRRC Qingdao Sifang Co., Ltd is the provider of 11 eight-car trains. Up to date, the construction has been finished 25% with the expectation that the completion will be attained in 2021. It is two years later than the original plan.

The project is being funded through both debt and equity investments. China Development Bank (CDB) is the sole financing source for the debt in the form of

loans while PT-KCIC is responsible for the equity investment. CDB would provide the loans without any guarantee from Indonesia's government. The loans account for 75% of the total financing need for the project. Among the loans, 60% is in US dollar and 40% in RMB, with 2% and 3.46% annual interest rate, respectively. Although the loan agreement was signed in the middle of 2017, the first-phase loan of US$ 170 million and second-phase loan of US$ 1.1 billion were disbursed separately in May and July 2018, due to the problem of land acquisition. Besides, the third-phase loan of US$ 500 million is expected to be disbursed in December 2018 (The Jakarta Post, July 4 2018). On the other hand, the joint venture (PT-KCIC) is responsible for the equity investment accounting for 25% of the total cost. Due to the delay in land acquisition, the total project cost increased from US$ 5.5 billion to US$ 5.9 billion in 2018. Thus, to release the increased financial risk of Indonesia's SOEs, President Jokowi of Indonesia proposed to increase the share of China's consortium from 40% to 90% in joint venture in 2018. With this, Chinese companies and bank would take major responsibility of financing for the project.

The project comes with some promising outlook for the section of Indonesian economy. The project costing approximately US$5.9 bn as on May 2018 promises to use up to 60% materials which are provided domestically within Indonesia and estimated to have created over 40,000 jobs during the 3 years' construction period. After few initial barriers, the project construction has started in the middle of 2018.

b. Risks to the project outcome

The project's outcome may be subjected to several risks. In this section, we outline the risks which may challenge the progress of the project or may erode expected cash flows, after project is completed. For the ease of reading, we broadly classify the risks into three categories; 1/ institutional which includes, among others, land acquisition, 2/ technical such as risks from topography and finally, 3/ economic and viability.

b.1 Institutional risks

Slow progress of land acquisition is the major factor causing delay of the project in 2018. Total land needed for the project is 600-hectare, acquisition of which would affect approximately 6800 plots in industrial, residential and green buffer zone. This broadly conflicts with the national spatial plan (RTRW), and therefore, the National Land Agency (BPN) is not able to issue permits for the land acquisition for the major part of the project, especially for the tracks which were added later on. In order to facilitate the land acquisition, the new spatial plan issued in April 2017 included parts of the land needed for the project. Nevertheless, some routes are in the green buffer zone that could not get permits from BPN even with the new spatial plan. The project also suffers from issues which are to be resolved with the Indonesian Air Force regarding the acquisition of the land of Halim Perdanakusuma airport. PT-KCIC constructs 408 replacement houses for the employees of air force and waits for them to move before demolishing the old ones which in turn extends the timeline as well as adds cost to the project. Up to February 2018, the clearing of private lands has been

completed below 10% which is far behind the general rate of progress (Mei, 2018).

The project is estimated to replace about 2,300 houses which include 728 farming households (The Jakarta Post, January 25, 2016) who are likely to lose their livelihood, cumulating the possibility of social unrest. Although the country's growing rubber plantation could help release part of the pressure over time, the socio-economic and legal barriers may hinder the project's progress for some time. From the environmental perspective, the impact is more thorough. The railway project changes the land usage from community farm to a monoculture-based plantation and commercial use, like train stations, new cities, residential housing area and industrial zone will likely lead to overexploitation of water resource and water pollution which in turn bring negative impacts on the water supply and catchment. In the long run, the water pollution and other relevant pollution will affect people's health lowering the living standards, which shifting social life in the town.

Additionally, the overlapping role of different public sector departments in the management of projects involving state-owned enterprises and some of the existing regulations may pose challenges for the project. Although several of those regulations have been greatly simplified under the current president Jokowi in order to facilitate the project, several still remain. There are multi-level laws and regulations, such as presidential regulation, provincial decree, sector regulation, cross-sector operational guideline, etc. in this regard. The project needs to satisfy all of them in order to make progress. President Jokowi has signed two presidential regulations and revised laws since 2015 to smoothen the land acquisition by making the project as one of the strategic national projects. However, the project pertains not only to the presidential and sector levels but also to the local levels. Therefore, changing the regulations at all levels without creating much resistance from the other socio-economic activities will take some time. It is widely known that the recent changes in regulations favour this project since the project receives strong supports from President Jokowi. However, if he fails to win the upcoming election in 2019, the question whether his successor would make such a favourable regulatory arrangement for the project, increases uncertainty over its outcome. In addition, a bunch of public sector departments and agencies, like Ministry of National Development Planning/ National Development Planning Agency, Ministry of Finance and Coordinating Ministry of Economic Affairs and a few others, need to communicate and coordinate on timely manner for making the project a success. It may be time-consuming to get all kinds of permits from relevant organizations under certain circumstances, which may potentially raise the project's cost.

b.2 Technical risks

At the technical level, the risks mainly arise from the local topography and geological conditions, such as land subsidence or sudden earthquake disasters. The topography along the Java HSRP line is quite complicated, which might require special attention and methods for solving. Firstly, the topography along the Java HSRP is diverse and complex which includes steep slopes which may be the cause of concern

for the operation of HSR. According to the 'Feasibility Study for Promotion of International Infrastructure Projects in FY2011' by Yachiyo Engineering Co., Ltd. and Japan International Consultants for Transportation Co., Ltd., the steepest slope can be up to 30%, and may continue to increase because of the land subsidence, as a result of the overuse of underground water. The land subsidence itself can also be a problem, because it makes the rail uneven. In order to overcome the issue, the China Rail High-speed (CRH) is increasingly replacing the railroad by the viaduct bridge, which can be 58% of the total length of the HSR. However, these challenges may potentially be mitigated by the expertise of CRH which reportedly owns some of the world's longest high-speed railway networks with high operating speed, and low occurrence of accidents. As for the variety of constructive and operational environment, CRH have faced similar or more severe problems comparing with Java HSRP, such as the land subsidence, high temperature, and the tunnels and bridges.

b.3 Economic and viability risks

Apart from the above regulatory and institutional risks, the project outcomes may be subject to any possible shortfall in demand for the service from its projection. The total revenue from this project between 2019 until 2050 is US$ 62.2 billion, with ticket price per person recently adjusted upward to $35. The upgraded price $35(RMB 238) is higher than the price set for the high-speed rail between Nanjing and Shanghai, one of the wealthiest regions in China with similar technology. The above revenue projection for the Jakarta-Bandung high-speed rail puts an implicit assumption that about 1,35,000 persons per day avail the service by 2050. This is much higher the current numbers of people commuting between Jakarta and Bandung using all modes of transport at only 19,000 persons per day. In fact, a large proportion of the commuters lie in the relatively low-cost mini-bus segment. This indicates that there could be a potential demand gap for the service in the future. In addition, continuing delay on land acquisition and regulatory complexities will inevitably put upward pressure on the project cost, raising concerns about the profitability and viability of the service.

The project outcome is subject to several possible macroeconomic risks. Any large unanticipated fluctuation in the global prices of commodities which may include steel, cement and other relevant materials, may potentially escalate the project cost. Any large depreciation of the Indonesian currency against the major global currencies will also result in erosion of cash flows in currencies other than Indonesian Rupiah. This will mostly affect the cash flows to the Chinese stakeholders. On the other hand, both in cases of project cost escalation due to commodity price fluctuation and reduced cash flows due to exchange rate risks, the stakeholders have limited room for adjusting the fares upward to recover the cost, as that will reduce the demand, stressing further the cash flows.

In nutshell, potential risks to the progress of the project arise from the slow progress of land acquisition, uncertainty about the outcome of national election due in 2019 and the attitude of alternative governments, cost escalation on account of delays due to regulations and challenges faced by the topography and shortfall of

demand from the estimated one. The risks will, in fact, jeopardise the positive impacts on the Indonesian economy likely to be exerted by this project that we discuss in the next section.

c. Economic and financial impacts

c.1 Economic impacts

We estimate the project's impact on the regional GDP of Indonesia following Zou et. al. (2018). According to the theoretical framework in Zou et. al. (2018), HSR reduce the bilateral trade cost between regions by consuming lesser amount of time than the conventional modes of transport. The reduction in the bilateral trade cost has two main effects. First, this results in the reduction in final product's price in the 'destination' area, which implies an increased 'market access' by the consumers in the 'destination' region. Secondly, the cost reduction means some efficiency gain for the producers in the 'source' region, which allows them to produce more goods. The latter is the gain in 'market access' by the producers in the 'source' region. In total, there is increase in the 'market access' for the regions covered by the HSR.

Zou et. al. (2018) suggest that the introduction of high-speed rail network in 110 prefecture level cities in China increased market access by the firms in the region. The empirical estimates suggest that a 1% increase in the market access leads to increase in the real income of the region by over 0.12%. Zou et. al. (2018) estimated that the removal of all high-speed rail in China would result in over 76% fall in the market access and reduce real income by over 9%. Zou et. al. (2018) estimates the market access in the following way;

$$MA_0 \approx \sum_d \tau_{0d}^{-\theta} Y_d^r \quad \text{..... (1)}$$

where MA_0 is the aggregate market access in the source region (indexed '0'), Y_d^r is the real income or GDP of the destination region (indexed 'd'), τ_{0d} summarises the bilateral trade costs between source and destinations and θ is the trade elasticity. Further,

$$\tau_{0d} = 1 + t_{0d}^{0,6} \quad \text{..... (2)}$$

where t_{0d} is the shortest time travelled between the source and destination. Zou et. al. (2018) estimated the aggregate market access for the firms in 110 cities in China, both before and after the introduction of high-speed rail network.

We identify 6 regions that are likely to be directly impacted by the proposed rail network. These are; Jakarta province, Bekasi city, Karawang regency, West Bandung regency, Cimahi city, and the Bandung city. As per the current plan, the stations are; 1/ Halim at the Jakarta end, 2/Karawang, 3/ Walini, 4/Tegalluar and 5/Tegalluar depot at the Bandung end. We assume that, the areas likely to be impacted by the Halim station are Jakarta province and Bekasi city while West Bandung, Cimahi and Bandung broadly include the areas under the coverage of Walini and Tegalluar. There has been some discussion on the extension of the network soon to the Surabaya city in the Majalenka regency, which we also include in our estimates. Following Zou et. al. (2018), we prepare a 7X7 matrix of travel time between each location, based on several sources in the internet and researchers' experience. We prepare two separate matrix of travel time based on the modes of transport existing at this moment (includes regular train from Jakarta and road

transport) and of the proposed travel time using the high-speed rail (Tables 1a and 1b in the appendix).

We construct a 7X7 matrix for the unit logistics cost between the selected locations, under both scenarios (pre- and post- high-speed rail). We measure the logistics cost in the pre-high-speed rail scenario by the cost of transporting cargo weighing about 1 ton by road between cities (cektariff.com). Logistics cost between Jakarta and Bekasi is proxied by the within-city transportation cost in the metropolitan area which is about IDR 5,000. We do not have specific information about cargo shipping by the high-speed rail at this moment. In this case, we subtract the cost of within-city cargo shipment from the total cost of pre-high-speed rail scenario and multiply that with a factor of 1.5, which is the ratio of per-person ticket in the high-speed rail between Jakarta and Bandung to the ticket cost per person in bus or regular train for the same distance. For non-metropolitan cities, such as Karawang, Cimahi, Bandung and Majalenka, we assume the unit cost of within-city transportation to be IDR 3,500 while for Jakarta and Bekasi, we assume this cost to be IDR 5,000. Finally, we add back the cost of inter-city cargo shipment to arrive at the final cost of transportation by the high-speed rail, as we assume that in order to use the high-speed rail, in any case, the firms need to do some shipment arrangements within the city to move goods from the plants to the railway stations. The estimated unit logistics costs are given in tables 2a and 2b in the appendix.

In our estimation, we multiply the travel time with the cost of transportation for each pair of source-destination to arrive at the composite estimate for t_{od} in equation (2). Finally, we estimate the bilateral trade cost t_{od} between each pair of locations using (2) for both pre- and post- high-speed rail scenarios. Clearly, increase in either of travel time or the travel cost would result in an increase in the bilateral trade cost. Finally, we estimate the market access MA_o using (1) under each scenario. While estimating MA_o, we hold the real income Y_d^T constant, between two scenarios. Therefore, the change in market access reflects the gains only from the high-speed rail network. Following Zou et. al. (2018), we assume the trade elasticity to be 3.8.

Our estimation suggests that the proposed high-speed rail network may potentially increase the aggregate 'market access' in the range of 100-150% over long-run. We estimate a 100% increase in the 'market access' when we consider both shorter time taken but potentially higher unit logistics cost by the HSR. Our estimates suggest almost 150% increase in the 'market access' when we do not assume a higher unit logistics cost in HSR compared to existing modes of transport. Considering the estimates in Zou et. al. (2018) that a 1% increase in market access increases the real income by almost 0.12%, the proposed Jakarta-Bandung high speed rail may potentially increase the real income or GDP of the region in the range of 12-18% over time. The associated Transit Oriented Developments (TODs) planned along the line such as a tourist spot in Walini and a transit route connecting to Jakarta's main international airport in Halim is likely to boost growths in tourism and transport services in the future, in addition to the gains from increased market access by the existing businesses as we estimated above.

The Indonesian economy stands to gain during the construction phase of the project

too. As per the estimates available in May 2018, the project costs approximately US$ 5.9 bn. We assume that the labour cost constitutes 40% of the total project cost, and the project entirely employs Indonesian labour force. According to several estimates, the project would generate over 40,000 jobs in Indonesia over the construction period. Further, 60% of the materials (i.e. total cost minus the labour cost) would be domestically supplied, according to the contract with the Chinese counterpart. Therefore, of the US$ 5.9 bn total project cost, potentially US$ 4.6 bn is being added back to the Indonesian GDP over the 3 years of construction period. This amounts to 0.1% of the Indonesian annual GDP over 3 years.

c.2 Financial impacts

The financial impacts of this project to the stakeholders arise from the materialisation of any risk to the progress and the project outcome, that we discussed in the previous section. Risks which challenge the progress of the rail's construction such as delays in land acquisition, environmental and other legal clearances, unexpected fluctuations in the global prices of commodities such as steel, may result in, up to a complete halt of the project, making the entire or at least a part of the invested assets of the stakeholders '*non-performing*'. In alternative scenarios, these shocks would at least amplify the project's cost which the sponsors may not be able to recover through the current settings of rail fare. The projected future cash flows from this project might be challenged if the demand for the service falls short of the expectation and also in case of large unanticipated depreciation of the Indonesian currency vis-à-vis other major currencies. This would reduce future profitability of the project and would result in financial implications for the stakeholders.

We estimated that, these risks may potentially reduce the combined annual operating income of the four Indonesian state-owned enterprises by almost 0.4%, over the next 40 years. Similarly, we estimate the loss in operating income to the tune of 0.2% for CRRC and 0.01% of CDB, respectively. In doing this, we assume that, to recover at least the project cost, the sponsors would require total operating income which is equal to their respective investment/loans plus the interest income (in case of CDB only) over the 40 years of break-even period. Therefore, we divided the current loan/Investments plus the interest income of CDB, CRRC and Indonesian state-owned enterprises, respectively, by 40 and expressed them as percentage of their respective operating incomes, as on 2015 (for CDB, we take 2016's operating income).

In case of the complete halt of the project due to any of these risks, the assets of these enterprises in the forms of investments and loans into this project become '*non-performing*'. This means, for CDB, the full or a significant portion of the US$ 4.8 bn worth of loans towards this project, which accounts for 2.3% of CDB's total assets as on 2016, may turn into a non-performing loan. Similarly, CRRC's current investment of US$ 0.72 bn may turn into non-performing (or bad) assets, effectively reducing its assets by 0.07%, based on the CRRC's assets as on 2015.

There is no '*direct*' cost to the Governments of both Indonesia and China, since neither are directly involved into this project. However, this project is being

funded by the state-owned enterprises from both the countries, which constitute the '*contingent liabilities*' for the respective governments. Substantial deterioration in their asset qualities may require at least some recapitalisation by the respective governments and therefore, would ultimately incur fiscal expenses. We estimated that the loans extended by CDB and the investment by CRRC into this project together constitute about 0.04% of the Chinese annual GDP or, 0.13% of China's fiscal expenditure, based on the official estimates for 2018. Similarly, the combined investment by the four Indonesian state-owned enterprises account for 0.04% of the Indonesian annual GDP, 0.27% of fiscal expenditure, based on the official estimates for 2018. Therefore, in case of substantial loss to these state-owned enterprises due to any of these risks, the fiscal costs could be only up to 0.04% of each country's annual GDP.

3. Conclusion

In this paper, we assess the economic and financial impacts of the proposed Jakarta-Bandung high speed railway project. Our assessment following Zou et. al. (2018) suggests that, over the long run, the project may increase the combined income of Jakarta, the neighbouring province Karawang and the country's major industrial centre Bandung, by an estimated 12-18%, by increasing aggregate 'market access' by the producers and consumers in the region. We estimated that the project is likely to increase Indonesian real GDP by almost 0.4% during its construction phase, with certain assumptions on the returns to capital. On the other hand, although the project is expected to generate over 40,000 jobs in Indonesia, according to several sources, the project may entail an immediate loss of over 2,000 traditional jobs around the track. In addition, Transit Oriented Development plans, such as tourist spot in Walini, residential complex around the project site etc. are likely to affect community farming and water supply in the region. The progress of the project is already been challenged by such legal and institutional barriers which include the ongoing issues related to the land acquisition. As on May 2018, only 60% of the land acquisition had been completed. This has led to an upward revision of the project cost in 2018, leading to more than doubling its projected per-person fare, as compared to the initial estimates. Such sharp increase in the existing fare together with any further revision may challenge the estimated ridership.

The sluggish progress of the project exerts financial risk to the stakeholders, especially since the project has no 'guarantee' from the Indonesian government. We estimated that, the China Development Bank, as a majority fundraiser, bears significantly large portion of the risk than the other stakeholders in the project. The financial risks faced by the Indonesian counterpart, on the other hand, is significantly smaller. We infer that, taking such high risk by the Chinese part may be justified due to a strong backup from the Chinese government, whose likely contingent liability from this project is very low. In addition, the project likely serves China's geopolitical interest in the region. Further, the contingent liability for both the governments, however might be smaller as compared to the long-run benefits to the Indonesian economy. Therefore, we assess that the project might be beneficial in the long-run although several legal and financial challenges may emerge in the short term.

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Appendix

Table 1a: Travel time by road and regular rail (hrs)

	Jakarta province	Bekasi city	Karawang regency	West bandung regency	Cimahi city	Bandung city	Majalenka regency
Jakarta province	0	1	1.5	4.5	3	4.5	8
Bekasi city	1	0	0.5	3.5	2	3.5	7
Karawang regency	1.5	0.5	0	3	1.5	1.5	6.5
West bandung regency	4.5	3.5	3	0	1.5	2	6
Cimahi city	3	2	1.5	1.5	0	1.5	5
Bandung city	4.5	3.5	1.5	2	1.5	0	3.5
Majalenka regency	8	7	6.5	6	5	3.5	0

Table 1b: Travel time by high-speed rail (hrs): estimated

	Jakarta province	Bekasi city	Karawang regency	West bandung regency	Cimahi city	Bandung city	Majalengka regency
Jakarta province	0.0	0.0	0.3	0.7	0.8	0.8	1.0
Bekasi city	0.0	0.0	0.3	0.7	0.8	0.8	1.0
Karawang regency	0.33	0.33	0.00	0.33	0.42	0.42	0.67
West bandung regency	0.67	0.67	0.67	0.00	0.08	0.08	0.33
Cimahi city	0.75	0.75	0.75	0.08	0.00	0.08	0.33
Bnadung city	0.75	0.75	0.75	0.08	0.42	0.00	0.33
Majalenka regency	1.00	1.00	1.00	0.33	0.67	0.33	0.00

Table 2a: Transportation cost by road and regular rail (US$)

	Jakarta province	Bekasi city	Karawang regency	west bandung regency	Cimahi city	Bandung city	Majalenka regency
Jakarta province	0	5000	6000	6250	6500	6550	8000
Bekasi city	5000	0	5460	6000	6250	6500	6550
Karawang regency	6000	5460	0	6000	6000	6250	6500
West bandung regency	6250	6000	6000	0	3500	5000	6000
Cimahi city	6500	6250	6000	3500	0	3500	6000
Bandung city	6550	6500	6250	5000	3500	0	6000
Majalenka regency	8000	6550	6500	6000	6000	6000	0

Table 2b: Transportation cost by high-speed rail (US$): estimated

	Jakarta province	Bekasi city	Karawang regency	West bandung regency	Cimahi city	Bandung city	Majalengka regency
Jakarta province	0	5000	6500	6875	7250	7325	9500
Bekasi city	5000	0	5690	6500	6875	7250	7325
Karawang regency	6500	5690	0	7250	7250	7625	8000
West bandung regency	6875	6500	7250	0	3500	5750	7250
Cimahi city	7250	6875	7250	7250	0	3500	7250
Bnadung city	7325	7250	7625	7625	3500	0	7250
Majalenka regency	9500	7325	8000	8000	7250	7250	0

Source for tables 1a and 1b: Authors' estimates.

Source for tables 2a and 2bÿceltariff.com and other logistics websites; Authors' estimates.