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Socio-Economic Impacts and Sustainable Development Strategies in West Java through the China Indonesia High Speed Rail (KCIC)

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Abstract— KCIC is a company providing high-speed rail services between Jakarta and Bandung, with departures from Halim to Tegalluar stations. The project is expected to increase economic growth through technological advancements, leading to increased employment opportunities and improved living standards for local communities. This study aims to determine the socio-economic impacts before and after the introduction of KCIC, identify the infrastructure at KCIC station, and provide recommendations for sustainable development strategies. The methods used in this study are Klassen's typology and qualitative methods, employing a descriptive approach. The study found a positive impact of the KCIC project on unemployment and poverty levels in West Java. In addition, this study provides advice to the West Java Government regarding efforts for addressing socio-economic impacts and implementing sustainable development strategies through KCIC.
Keywords: *Development Strategy; Environmental Preservation; KCIC; Socio-Economic; Spatial Planning.*

I. INTRODUCTION

According to Soliha and Maryaningsih [13], infrastructure development plays an important role in increasing economic growth. Regions with high economic growth often have adequate infrastructure. The China-Indonesia Fast Train (KCIC) project, which connects Jakarta and Bandung, is expected to positively impact the economy of West Java [7]. In this context, the development of economic activity can be observed through economic growth.

Based on data from the Central Bureau of Statistics, West Java's economic growth decreased by 0.35% following the construction of KCIC. On average, West Java's economic growth from 2014 to 2023, excluding the pandemic years of 2020 and 2021, was 5.28%. Meanwhile, economic growth in 2024 after the KCIC is 4.93%. In addition, the implementation of this project has caused various social and economic impacts on local

communities, including the displacement of pre-existing residents and small businesses. According to the Central Bureau of Statistics, the unemployment rate in West Java was 8.54% in 2014, before the construction of KCIC, and 6.91% in 2024, after its completion. The data indicates a decrease in the unemployment rate in West Java. However, the unemployment rate in West Java remains higher than the national average of 5.10%. This situation highlights the unemployment rate in West Java is still higher than in other regions in Indonesia. Thus, additional efforts are required to address the unemployment issues. This research is motivated by the need to optimize the benefits of the project for economic growth and the improvement of community welfare.

Large-scale infrastructure projects have the potential to significantly impact the economic and social development of a region [2]. However, these impacts are not always positive; such projects can also lead to evictions and other social problems [8][9]. Therefore, a comprehensive sustainable development strategy is necessary, including integrated spatial planning, local economic empowerment, and environmental preservation. By implementing this strategy, it is expected that the economic benefits of infrastructure projects will be optimized while minimizing negative impacts on communities and the environment.

This study aims to determine the social and economic impacts before and after the KCIC project, identify KCIC station infrastructure in West Java, and provide recommendations for sustainable development strategies that can be implemented. Thus, the KCIC project is expected to make a greater contribution to economic growth, job creation, income increase, and infrastructure improvement in West Java.

II. METHOD

This research uses secondary data, collected through documentation studies and literature studies. These methods were employed to gather secondary data relevant to the research objectives. To determine the social and economic impacts before and after the KCIC project, this study uses time series data from 2014 to 2024, sourced from the Central Bureau of Statistics. The variables analyzed include per capita income, poverty, and unemployment. The pre-KCIC condition is represented by the average data from 2014 to 2022, while the post KCIC condition is represented by data from 2023, the latest available data, which can be reasonably considered as reflecting post-construction conditions. To address the first research objective, this study applies the Klassen typology analysis, an analytical approach that categorizes sectors or regions based on certain characteristics [10]. The application of this method enables researchers to identify and understand the various dimensions of the KCIC project's impacts.

To address the second and third objectives of this study, the measurement of variables is conducted qualitatively, by considering aspects such as socio-economic impacts, sustainable development strategies, integrated spatial planning, local economic empowerment, and environmental preservation. These variables are measured based on the perceptions, experiences, and views of stakeholders involved in the KCIC project. Data analysis is conducted using qualitative techniques, including data reduction, data display, and conclusion drawing. The collected data is analyzed in depth to identify patterns, relationships, and underlying meanings.

III. RESULT AND DISCUSSION

A. Socio-Economic Impact of KCIC Development in West Java

The Jakarta-Bandung KCIC is expected to positively impact economic growth and regional competitiveness. However, it also has the potential to generate both positive and negative social impacts in the West Java province through which KCIC passes. In addition to promoting local economic development, the project is anticipated to create new employment opportunities that may help reduce unemployment. Rapanna & Sukarno [11] explain that per capita income refers to the average income earned by individuals in a region or country. It serves as an indicator of the government's success in measuring population welfare in the context of economic development and growth.

Based on data from the Central Bureau of Statistics, the average per capita income in West Java Province in 2014 was higher than the national average. However, this trend reversed in 2024, with the national per capita income surpassing that of West Java, despite both showing an overall increase since 2014. Meanwhile, the Gini ratio is an indicator used to measure the income distribution inequality within a population. Its value ranges from 0 to 1, where 0 indicates perfect equality, meaning that income or expenditure is evenly distributed across the population. Whereas 1 indicates real imperfection and inequality, where most of the income or expenditure is concentrated in a small portion of the population.

According to data published by the Central Bureau of Statistics, the Gini ratio in 2014 for both West Java and the national level was recorded at 0.406. By 2024, West Java experienced a decrease in income inequality, indicating a more equitable distribution of income among its population. In contrast, most other provinces experienced an increase in income or expenditure inequality from 2014 to 2024. An increasing Gini reflects a widening gap in income distribution.

High income inequality has the potential to exacerbate poverty, as disadvantages often face limited access to resources and economic opportunities. This can lead to a persistent cycle of poverty, where subsequent generations continue to experience the same economic difficulties. Based on data from the Central Bureau of Statistics, the poverty rate in West Java in 2014 and 2024, a trend that was nearly parallel to the national level. This suggests that prior to the implementation of KCIC project, the poverty rate in the West Java region was relatively high.

A high poverty rate can affect the unemployment rate, as individuals living in poverty often have limited access to education and training, thereby reducing their opportunities to obtain decent employment. Based on data from the Central Bureau of Statistics, the Open Unemployment Rate in West Java decreased by approximately 2% in 2024 compared to 2014. The Kereta Cepat Indonesia-China (KCIC) project plays a significant role in this decline. During its construction phase, the project generated substantial employment opportunities for local workers, particularly in areas such as construction, engineering, and project management. This contributed directly to the reduction in the unemployment rate in the region.

In addition, the KCIC project provides training and skills development for local workers, thereby increasing their prospects for future employment. Upon completion, it is expected to improve connectivity and transportation efficiency between Jakarta and Bandung, boost economic growth in those regions, and generate additional employment opportunities. Large-scale infrastructure projects such as KCIC also attract foreign and domestic investment, potentially increasing job availability in various sectors, including tourism, trade, and services. Overall, the KCIC project holds potential to reduce Indonesia's open unemployment rate through job creation, skills development, and increased economic investment.

To analyze GDP per capita and poverty conditions before and after the KCIC project with Klassen Typology Analysis. Adapting Klassen's typology, this study divides the regions in West Java into four quadrants: Quadrant I represents area with GDP per capita above West Java and poverty rates below the provincial average; Quadrant II includes areas with GDP per capita above West Java average but with poverty rates above the average; Quadrant III comprises area with GDP per capita below West Java average but poverty rates below the average; and Quadrant IV includes area with both GDP per capita and poverty rates below and above the West Java average, respectively.

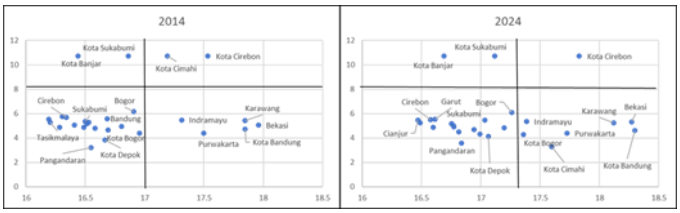

Fig. 1. Klassen's Typology of GDP Per Capita and Poverty (Before and After KCIC Conditions)
Source: Central Bureau of Statistics (processed from various years)

Based on the Klassen Typology analysis of GDP per capita and poverty using data from 2014 (before KCIC) and 2024 (after KCIC), there were only five regions prior to KCIC that had GDP per capita above the West Java average and poverty below provincial average. These regions were Bandung City, Bekasi, Karawang, Purwakarta, and Indramayu. However, following the development of KCIC, the regions meeting this criterion increased to 7: Bandung City, Bekasi, Karawang, Purwakarta, Indramayu, Cimahi City, and Bogor City.

Table 1 . Identification of Regional Groupings Based on The Klassen Typology Quadrant Of GDRP Per Capita And Poverty in 2014 And 2024

No.	Quadrant I	Quadrant II	Quadrant III	Quadrant IV
2014	Karawang, Bekasi, Kota Bandung, Purwakarta, dan Indramayu	Kota Cimahi dan Kota Cirebon	Bogor, Sukabumi, Cianjur, Tasikmalaya, Ciamis, Kuningan, Cirebon, Majalengka, Sumedang, Subang, Bandung Barat, Pangandaran, Kota Bogor, Kota Bekasi, Kota Depok, dan Kota Tasikmalaya	Kota Sukabumi dan Kota Banjar
2024	Karawang, Bekasi, Kota Bandung, Purwakarta, Indramayu, Kota Bogor, dan Kota Cimahi	Kota Cirebon	Bogor, Sukabumi, Cianjur, Bandung, Garut, Tasikmalaya, Ciamis, Kuningan, Cirebon, Majalengka, Sumedang, Subang, Bandung Barat, Pangandaran, Kota Bekasi, Kota Depok, dan Kota Tasikmalaya	Kota Sukabumi dan Kota Banjar

The development of KCIC positively influences GDP per capita and poverty levels around each station. Transportation infrastructure development improves economic welfare and reduces poverty levels. This increase aligns with expectations of the positive impact of the KCIC project, particularly in areas traversed by this fast train. One of the strategically important stations in the KCIC project is Karawang Station. It significantly increases the GDP per capita in the Karawang area due to increasing industrial and economic activities. In addition, Padalarang Station functions as a fast station and a fast train transit station in the Greater Bandung area, enhancing accessibility and GDP per capita around Padalarang. During the Jakarta-Bandung trip, Tegalluar station serves as the last station. Therefore, the GDP per capita of the Tegalluar area will increase along with the growth of industrial and economic activities in the region. This development indicates that KCIC functions.

Table 2. Socio-Economic Impacts Before and After KCIC on The Passed Area

Area	GRDP Per capita (Million Rp)		Poverty (thousand of souls)	
	Before there was KCIC	After the existence of KCIC	Before there was KCIC	After the existence of KCIC
Karawang	56,3	74,05	229,0	187,8
Padalarang	15,07	18,85	197,9	179,7
Tegalluar	17,61	24,95	115,0	101,1

(Notes: The condition before KCIC is 2014, while the condition after KCIC is December 2023.
Source: Central Bureau of Statistics (processed from various years)

To analyze GDP per capita and unemployment (before and after KCIC conditions), this study also adapts Klassen Typology Analysis. Regions in West Java are classified into four quadrants: Quadrant I represents a region with GDP per capita above West Java average and unemployment below the provincial average; Quadrant II represents a region with GDP per capita above the average, but unemployment above the average; Quadrant III includes a region with GDP per capita below the average, but unemployment below the average; and Quadrant IV includes a region with GDP per capita below West Java and Unemployment above West Java.

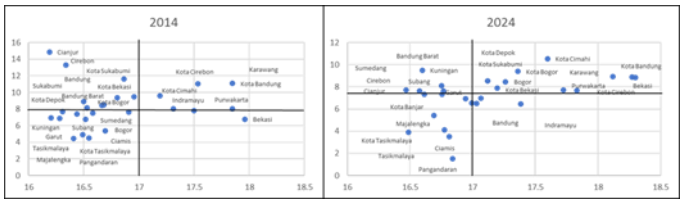

Fig. 2. Klassen's typology of GDP per capita and unemployment (Before and After KCIC Condition)
Source: Central Bureau of Statistics (processed from various years)

Based on the Klassen's Typology analysis of GDP per capita and unemployment using data from 2014 (before KCIC) and 2024 (after KCIC), prior to the KCIC project, only Bekasi had a GDP per capita above West Java and unemployment rate below West Java. However, after the existence of KCIC, the regions that have GDP per capita above West Java and unemployment rate below the provincial average. However, following the implementation of KCIC, the number of such regions increased to two: Bandung and Indramayu.

Table 3 Identification of Regional Grouping Based on Klassen Typology Quadrant of GDP Per Capita

No.	Quadrant I	Quadrant II	Quadrant III	Quadrant IV
2014	Bekasi	Kota Cirebon, Kota Cimahi, Kota Bandung, Karawang, Purwakarta, dan Indramayu	Sumedang, Bogor, Ciamis, Kota Tasikmalaya, Pangandaran, Majalengka, Tasikmalaya, Garut, Kuningan, Subang, dan Sumedang	Sukabumi, Cianjur, Bandung, Cirebon, Bandung Barat, Kota Bogor, Kota Sukabumi, Kota Bekasi, Kota Depok, dan Kota Bogor
2024	Bandung dan Indramayu	Kota Depok, Kota Sukabumi, Bogor, Kota Bekasi, Kota Bogor, Kota Cimahi, Karawang, Purwakarta, Kota Cirebon, Bekasi, dan Kota Bandung	Kota Banjar, Majalengka, Kota Tasikmalaya, Tasikmalaya, Ciamis, dan Pangandaran	Bandung Barat, Kuningan, Subang, Garut, Cianjur, Cirebon, Sumedang, dan Sukabumi

(Notes: The condition before KCIC is 2014, while the condition after KCIC is December 2023.
Source: Central Bureau of Statistics (processed from various years)

Specifically, the development of KCIC also positively influences reduction of unemployment in areas along its route. This is evidenced by a comparison of unemployment rates before and after KCIC. The development of new areas around each station has contributed to increased employment opportunities, thereby reducing unemployment in these regions.

Table 4 Impact of Labor Absorption Before and After KCIC in The Areas Passed

Area	Open Unemployment Rate (%)	
	Before There was KCIC	After the Existence of KCIC
Karawang	11,10	8,95
Padalarang	8,15	8,11
Tegalluar	8,48	6,52

(Notes: The condition before the KCIC was 2014, while the condition after the KCIC was December 2023
Source: Central Statistics Agency (processed from various years)

B. Infrastructure Condition of KCIC Stations in West Java

KCIC stations, known as Jakarta-Bandung High Speed Train (KCJB) stations, have three main stations in West Java: Karawang, Padalarang, and Tegalluar Station. These three stations are designed with four important aspects in mind: cleanliness, facilities, management, and architecture. Minister of Transportation Regulation No. 63 of 2019 concerning Minimum Service Standards (MSS) at railway stations stipulates that cleanliness is a key aspect that must be fulfilled. The hygiene aspect at KCJB stations has been well maintained. PT KAI (Persero) and PT KCIC have made efforts to improve the quality of cleanliness at stations served by the Whoosh Jakarta-Bandung High Speed Train (KCJB).

Regulation of the Minister of Transportation No. 63 of 2019 regarding Minimum Service Standards (MSS) also includes the standardization of facilities that must be available at train stations, including: spacious and comfortable waiting rooms, counters and vending machines, elevators and escalators, lockers, toilets, connectivity with further modes of transportation, sky bridges, and toll road access. A spacious and comfortable waiting area is provided for passengers awaiting the scheduled departure of the high-speed train. Facilities include lockers for storing personal belongings, vending machines for ticket purchases and other needs. Elevators and escalators are provided to facilitate passengers in moving between floors. Toilets are also available to meet passengers' needs.

KCJB Station will be connected to other train modes such as Jabodebek LRT, KCJB Feeder Train, and Bandung Raya Commuter Line. Skybridge makes it easier for passengers to switch transportation mode. Toll road access to the high-speed train station facilitates public accessibility. X-ray inspections are conducted to ensure that passenger luggage complies with regulations and to prevent prohibited items from entering the station area. With these facilities, Jakarta-Bandung High-Speed Train Station is expected to provide a different and comfortable experience for all visitors.

In terms of management, the Jakarta-Bandung High-Speed Rail (KCJB) represents a significant infrastructure project, managed through a partnership between PT KAI (Persero), Indonesia's state-owned railway company, and PT KCIC (Kereta Cepat Indonesia China), ensuring seamless integration of local expertise with advanced technology from China. When applying sustainability management theory [4], KCIC stations provide maximum benefits for passengers, society, and the environment [6]. Nine management components were analyzed. First, Operational Partnership: KCIC operates as a joint venture, leveraging the strengths of both partners. PT KAI provides local knowledge and experience, while PT KCIC introduces advanced high-speed train technology from China. This collaboration aims to provide an efficient and reliable high-speed rail service between Jakarta and Bandung.

Second, Staff Training: station personnel undergo specialized training. Chinese experts provide instruction regarding the operation of high-speed train technology, while PT KAI focuses on customer service training according to Indonesian standards. This dual training approach ensures staffs' readiness to manage both technical aspects and interactions with passengers. Third, Advanced Security Management: KCJB stations implement state-of-the-art security systems, including X-ray scanning and surveillance cameras. These measures enhance passenger safety and protect station facilities.

Fourth, Routine Maintenance: a dedicated technical team performs regular inspections and maintenance on tracks, trains, and station facilities. This proactive approach ensures safe and efficient operations. Fifth, Energy Efficiency: KCJB prioritizes energy-efficient technologies and utilizes renewable resources to reduce carbon impact. This commitment aligns the objective of global sustainability.

Sixth, Emergency Readiness: clear protocols are established to manage emergencies, including technical glitches or natural disasters. These procedures help protect passengers and maintain smooth operations. Seventh, Collaboration with Stakeholders: KCJB works closely with local governments, local businesses, and communities. These partnerships strengthen integration with the surrounding environment and promote sustainable development.

Eighth, Integrated Ticket System: KCJB's ticketing system is integrated with other modes of transportation, such as LRT (Light Rail Transit) and Commuter Line. This convenience enhances the travel experience for passengers. Lastly, Continuous Evaluation and Improvement: regular customer satisfaction surveys and performance analysis continue to drive improvements. KCJB is committed to providing high-quality services and addressing any areas that need improvement.

Regarding the architectural aspect, the Jakarta-Bandung High Speed Train (KCJB) Station has several Indonesian cultural characteristics. The station is dominated by river motifs and shapes, reflecting the station's location amidst several important rivers in West Java. The interior integrates Sundanese cultural elements through the use of motifs and materials such as wood and bamboo. Incorporating local elements in architectural design is essential for ensuring relevance to the cultural and geographical context, preserving cultural identity, and imparting uniqueness in the building [1].

C. *Sustainable Development Strategy Recommendations*

The development of the Jakarta-Bandung High Speed Train (KCJB) by PT Kereta Cepat Indonesia China (KCIC) in West Java is expected to increase community income through three aspects: spatial, economic, and environmental aspects. By developing Transit-Oriented Development (TOD) areas around KCJB stations, new property values and jobs can be created, while increased investment and tourism will enhance local economic growth. In addition, the reduction in carbon emissions from switching private vehicle trips to high-speed trains will improve environmental quality. Theories such as TOD, Endogenous Economic Growth by Romer [12], and Sustainable Development by UN (2019) support this strategy, which is expected to contribute significantly in improving the welfare of the people of West Java.

Develop transit-oriented development (TOD) by integrating residential, commercial, and public facilities in one area connected to the station. In this case, integration refers to providing easy access for pedestrians and public transportation users to the station. Facilitating access for these groups will improve the quality of MSME performance and contribute to increasing the income of low-income populations. In addition, supporting facilities must include improved connectivity between transportation modes to integrate KCJB with commuter trains, feeder buses, and other forms of mass transit. This requires the development of efficient interchanges at key stations. Interchange development can involve the constructions of bus shelters equipped with weather-protected seating and integrated drop-offs points, ensuring that bus and private vehicle drop-offs are not separated to reduce intermodal conflicts.

1) Economic Aspect

In this aspect, it is necessary to pay attention to the development of MSMEs and tourism in the KCBJ Station area. MSME development is an attempt to increase MSMEs around the station by developing the MSME industry and increasing MSME accessibility. This can increase community income and improve quality of life. Such improvements can be achieved by mapping the production flow in Karawang, Padalarang, Tegalluar, to increase production effectiveness and efficiency. Additionally, facilitating effective trading locations for street vendors promotes social and economic equity. This location mapping also contributes to a tidier station environment, positively impacting the aesthetic value of the building.

Tourism Development aims to increase tourism around the station by developing tourist facilities and accessibility. In addition to supporting MSMEs and street vendors, economic equity can be extended to surrounding communities with tourism potential. This development will not only benefit residents but also provide added value to KCJB stations in West Java.

2) Environmental Aspects

Environmental sustainability is an important aspect that must be maintained, both within the station area and its surrounding. Increased environmental preservation can begin with the addition of trash bins in frequently visited areas, the expansion of soil absorption zones, and the planting of shade-providing vegetation. In addition to environmental preservation, soil infiltration areas offer shaded places to block sunlight that can benefit both humans but also local wildlife. The planting of additional trees to promote sustainability will also increase the need for cleaning services, thereby creating new employment opportunities for nearby residents. However, beyond these physical measures, environmental awareness must be shared not only by KCIC but also by visitors and the surrounding community. The active participation and awareness of all stakeholders are essential in ensuring the success of this environmental development initiative.

IV. CONCLUSION

The KCIC project positively impacts unemployment and poverty levels in West Java. In addition to a 2% decrease in the unemployment rate, the KCIC project also enhanced GDP per capita faster than the West Java average. Moreover, the project has also improved welfare and reduced socio-economic disparities in some areas.

To achieve comprehensive sustainable development, the strategies that must be accelerated include spatial integration, local economic empowerment, and environmental conservation. All these strategies are essential to optimize economic benefits while minimizing negative impacts on society and the environment.

Meanwhile, to address the social and economic impacts of the KCIC project, seven recommendations are proposed. First, establish transparent communication with communities about the impacts of the KCIC project, including the relocation of residents and small businesses. Second, provide sustainable relocation assistance for displaced communities, including adequate social and economic facilities. Third, support affected small businesses through the implementation of small business development programs.

In addition, collaboration among the government, communities, and companies is essential to develop sustainable development strategies that address the social and economic needs of local populations. Furthermore, improving infrastructure around the station is necessary to support economic and social growth. Equally

important is the development of areas surrounding the station to increase opportunities for micro, small and medium enterprises (MSMEs) and improve community livelihoods.

Finally, implement job training and skills development programs to increase employment opportunities for the local community. These employment initiatives should support economic and social growth while contributing significantly to the broader economy.

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