

Economic corridor of industrial development in Indonesia

M A Berawi¹, P Miraj^{2,3}, H Sidqi³

¹Civil Engineering Department, Faculty of Engineering, Universitas Indonesia, Depok, Indonesia 16424

²Civil Engineering Department, Faculty of Engineering, Universitas Pancasila, Jakarta, Indonesia 12640

³Center for Sustainable Infrastructure Development, Faculty of Engineering, Universitas Indonesia, Depok, Indonesia 16424

Corresponding author: maberawi@eng.ui.ac.id

Abstract. Indonesia as an archipelago country categorize its regional development into six corridors from Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Maluku. Currently, industrial development becomes one of the highest contributing factors to the national economic growth. However, each region in the nation experience inequality of development mainly related to the infrastructure sector. Thus, the research aims to develop a sustainable economic corridor by considering the characteristics and its potential. The research uses a qualitative approach through a desk study, benchmarking and in-depth interview. Location Quotient is used for the method of the analysis tool. The results show each characteristic of every corridor in the country. Sumatera as national plantation and processing industry corridor, Java as cyber technology innovation and services center, Kalimantan as national energy reserves and processing, Sulawesi as national aquaculture and processing industry, Bali – Nusa Tenggara as national eco-tourism center, and Papua – Maluku as national ore mining and processing.

1. Introduction

Many researchers and academics have been developing the theory and concept related to regional development. On export base theory, the demand for products that produced by a region shall increase the level of competitiveness and suggest a positive multiplier effect on the area [1]. Others such as neoclassical theory, advocate components that support the export such as labor, places, resources, production mobility, technologies to the infrastructure [2, 3].

A growth pole theory argues that an economy of a region is centralized in a particular cluster and supported by linked industrial area [4, 5]. In some cases, the core industry cluster expanded into a secondary cluster and involved many other related sectors [6]. Direct and indirect benefits may take place to the regional activities such as purchasing at upstream and downstream industries, employment rate to retail business.

In recent years, a combination of economic and geography also being investigated. It considers economic activity on not only regions but also the interaction of human to deliver the commercial distribution [7]. That interaction might focus on partial stages of production, transportation, and consumption or in comprehensive ways [8]. As people and goods are being involved, many resources such as natural resources, industrial areas, infrastructure, and retails are linked and integrated into an economic activity system.



Indonesia as an archipelago country categorizes its regional economic development into six regions from Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Maluku [9]. Based on Industrial Development by United Nations in 2016, Indonesia's total export is about 60.1%. The number relatively small compared to neighboring countries such as Singapore (89.9%), Thailand (88%), Malaysia (80%), and Vietnam (78.4%).

As industrial development becomes one of the highest contributing factors to the economic growth, the country should evaluate the concept for each corridor. The neighboring country has conducted a similar experience. Malaysia successfully implemented the 11th Masterplan, which divided the regional development into five corridors from Iskandar Malaysia, North Corridor, East Coast Economic Region, Sabah Development Corridor and Sarawak CORE. This step is implemented to strengthen the economic resilience of each region by making particular development, so each corridor has the foundation to develop and maintain the economic condition.

The research aims to develop a sustainable economic corridor by considering the characteristics and potential of each region. This study refers to Masterplan for Acceleration and Expansion of Indonesia's Economic Development 2011-2025 (MP3EI). The result expected to produce alternative approach in determining a general characteristic of each region in the country. It shall be used for decision making for national and international related to public policy.

2. Methodology

The research uses a qualitative approach through a desk study, benchmarking and in-depth interview to generate the expected output [10, 11]. It follows three stages; identification of potential industries, identification of possible commodity and select corridor characteristic. Identification of potential industries generated from a desk study which obtains from manuscripts, government reports, and other related documents. It analyzed using location quotient (LQ) approach to show the most potential industry in the region expressed by LQ higher than one. Subsequently, two sub-sectors of each province with most significant of a share of GDRP is chosen for further analysis.

LQ is used to compare the contribution of the industry from regional (GRDP) over the nation (GDP). LQ coefficient range from zero to infinity. When the LQ shows ratio more than 1, the industry has a potency in its region and vice versa [12].

$$LQ_i = \frac{p_i/p}{P_i/P}$$

Where :

LQ_i = LQ value for investigated corridor

p_i = GRDP of the industrial sector in the investigated corridor

p = GRDP of the total investigated corridor

P_i = GDP of national industrial sector

P = National GDP

Three highest industry in LQ analysis will further be analyzed. Potential commodity evaluated based on the production, resource availability, current usage over the corridor and national conditions. Leading products in each province act as the basis for the development in each corridor. Furthermore, the highest contributor for GRDP will be selected as the characteristic of the corridor.

3. Result and Discussion

3.1. Identification of Potential Industries

The identification of potential industries in each corridor is developed by various sectors which contribute to the gross domestic product (GDP) of the nation. It may correlate to the primary, secondary to tertiary industries which process natural resources. It consists of seven sectors such as Agriculture, Forestry, and Fishing; Mining and Quarrying; Processing Industry; Electricity and Gas; Sewerage, Waste Management and Remediation Activities; Accommodation and Food Service; and Information and Communication.

From the analysis, most of the corridor heavily relies on industries that process raw material or natural resources such as agriculture, forestry, and fishing as well as mining and quarrying. Kalimantan, Bali – Nusa Tenggara and Papua – Maluku islands depends on mining and quarrying for their local economic growth which shows by significant LQ figure. While many other corridors rely on raw material industries, Bali – Nusa Tenggara is the only corridor that produces similar large LQ between commodities and services. Bali is a province in Indonesia that exploit their tourism sector efficiently. Travelers around the world are well known the island beauty, and thus many of them visited regularly. It then contributes to the local economic growth from accommodation, meals, and other services. The result of LQ analysis can be seen in Table 1.

Table 1. Potential Industries On Each Corridor In Indonesia.

Corridor	Industry	LQ
Sumatra	Agriculture, Forestry, and Fishing	1.797817
	Mining and Quarrying	1.501803
Java	Accommodation and Food Service	1.290435
	Information and Communication	1.246748
	Manufacturing	1.21433
Kalimantan	Mining and Quarrying	4.064566
	Sewerage, Waste Management, and Remediation Activities	1.271765
Sulawesi	Agriculture, Forestry, and Fishery	1.923598
	Sewerage, Waste Management, and Remediation Activities	1.582885
Bali - Nusa Tenggara	Information and Communication	1.003989
	Accommodation and Food Service	9.783
Papua – Maluku Island	Agriculture, Forestry, and Fishery	19.407
	Mining and Quarrying	9.322
Papua – Maluku Island	Mining and Quarrying	3.354504
	Sewerage, Waste Management, and Remediation Activities	1.371022
Papua – Maluku Island	Agriculture, Forestry, and Fishery	1.069009

Further analysis identifies five potential sub-industries in Sumatera corridor, (1) food crops, (2) plantation crops, (3) fishery, (4) crude petroleum, natural gas and geothermal, and (5) iron ore mining. The detail potential sub-industry and the location in each province shown in Table 2.

Table 2. Sub – Industry on Provinces In Sumatera Island.

Province	Industry - Sub Industry				
	Agriculture, Forestry and Fishing			Mining and Quarrying	
	Food Crops	Plantation Crops	Fishery	Crude Petroleum, Natural Gas and Geothermal	Iron Ore Mining
Aceh	√	√			
North Sumatera	√	√			
West Sumatera	√	√			
Bengkulu	√		√		
Riau		√		√	
Riau Island			√	√	
Bangka					
Belitung Island		√			√
Jambi		√		√	
South Sumatera		√		√	
Lampung	√	√			

On the other hand, Java corridor should focus on six sub-sector in manufacturing industry such as chemical, fabricated metal product, transport equipment, tobacco, foods, and beverage, as well as coal and refined petroleum products. The detail potential sub-industry and the location in each province shown in Table 3.

Table 3. Sub – Industry on Provinces In Java Island.

Province	Industry - Sub Industry						Accommodation, Food Service	ICT
	Manufacturing							
	A	B	C	D	E	F		
Banten	√	√						
DKI Jakarta			√					√
West Java		√	√					
Central Java					√	√		
DI Yogyakarta							√	√
East Java				√	√			

Note:

- A: chemical
- B: fabricated metal product
- C: transport equipment
- D: tobacco
- E: foods and beverage
- F: coal and refined petroleum products

Four sub-industry should be developed for Mining and quarrying industry in Kalimantan corridors such as (1) crude oil, natural gas and geothermal, (2) coal and lignite mining, (3) iron ore mining, (4) other mining and quarrying sub-industry. In Sulawesi corridor, food crops, plantation crops and fishery shall be the focus of local government for development. Sub-industry on both corridors shown in Table 4 and Table 5.

Table 4. Sub – Industry on Provinces In Kalimantan Island.

Province	Industry - Sub Industry			
	Mining and Quarrying			
	Crude Petroleum, Natural Gas and Geothermal	Coal and Lignite Mining	Iron Ore Mining	Other Mining and Quarrying
North Kalimantan	√	√		
East Kalimantan	√	√		
Central Kalimantan		√	√	
South Kalimantan		√		√
West Kalimantan			√	√

Table 5. Sub – Industry on Provinces In Sulawesi Island.

Province	Industry - Sub Industry		
	Agriculture, Forestry, and Fishing		
	Food Crops	Plantation Crops	Fishery
Gorontalo	√		√
North Sulawesi			√
South East Sulawesi			√
Central Sulawesi			√
South Sulawesi	√		√
West Sulawesi		√	√

Unlike Sulawesi corridor, agriculture, forestry and fishery industry in Bali – Nusa Tenggara has three sub-industry potential from (1) fishery, (2) food crops and (3) animal husbandry. Last, the potential industries for Papua-Maluku corridor are consist of food crops, plantation crops, forestry, fishery and iron ore mining. The detail can be seen in Table 6 and Table 7.

Table 6. Sub – Industry on Provinces In Bali –Nusa Tenggara Islands.

Province	Industry - Sub Industry			
	Agriculture, Forestry and Fishery			Accommodation, Food Service Activities
	Fishery	Food Crops	Animal Husbandry	
Bali	√	-	-	√
West Nusa Tenggara	√	√	-	-
East Nusa Tenggara	-	√	√	-

Table 7. Sub – Industry on Provinces In Papua - Maluku Islands.

Province	Industry - Sub Industry				
	Agriculture, Forestry and Fishing				Mining and Quarrying Iron Ore Mining
	Food Crops	Plantation Crops	Forestry	Fishery	
Maluku	√			√	
North Maluku		√			√
Papua				√	√
West Papua			√	√	

3.2. Commodity in Sumatera Corridor

Aceh province has primary product for soybean. Annual production estimated about 47,910 ton and ranked first in the corridor and six in the nation. The region also produces coffee about 49,500 ton, makes it fourth producer in the corridor and fifth in the nation. Aceh Coffee has also been known for its quality and becomes one of a national flagship product. On production perspective, Aceh is the largest arabica coffee in Indonesia.

North Sumatera has potential commodity on rice and corn. The rice production in the province ranked second in the corridor and six in the nation. Corn with 1,519,000 ton makes it ranked first on the regional level and fourth on the national level. West Sumatera has sweet potato and cacao as the most potential commodity.

In term of oil and gas sector in the corridor, four provinces from Riau, South Sumatera, Riau Island and Jambi as the most contributor not only regional but also national oil and gas production. Riau also has coconut and palm commodities which both are Indonesia's flagship product for exports. Lampung province has three potential products such as rice, corn, and cassava. The production of cassava ranked first at the national level. Another commodity such as sugar cane, coffee, and pepper also ranked high in term on production capacity.

3.3. Commodity in Java Corridor

Banten commodity depends on chemical, pharmacy, and traditional medicine. The province is investment center on the sub-sector from a various country such as Japan, USA, South Korea, Singapore and Spain. The commodity in the province contributes 10% to the national industry. Metal, electronics to electrical parts also produced and ranked fourth for domestic investment in the sector.

Jakarta is the capital city has the potential about transportation and ICT. Transport related to a huge number of private vehicle ownership to a population which then attract investment in the sector. The high demand for internet connection and e-commerce also contribute to the province economic activities.

Foods and beverages are one of the most attractive sectors in areas from Central Java, DIY, and East Java. Central Java also has potential in term of coal as well as oil and gas refinery in Cilacap. DIY has a similar interest in ICT as the capital city. It shown by the province ranked second for the internet access by the people. Last, East Java has commodity at tobacco processing industry. They ranked first in term of production capacity across the nation.

3.4. Commodity in Kalimantan Corridor

North Kalimantan has the potential in term of oil and gas as well as coal and lignite mining. Coal in the province contributes for about 5% from the total of national production. East Kalimantan has a commodity in oil and gas, geothermal, coal and lignite. The production is relatively massive for every product. It contributes 12.8%, 20.7%, and 60% from the total of national production.

Central Kalimantan has the commodity in iron and gold. The gold mining in the province is one of the largest in Indonesia and reserved 45 million ton of gold. On the other hand, South Kalimantan relies on the commodity of marble and coal and lignite. Last, West Kalimantan has bauxite and quarts for the potential economic development of the province. Bauxite in the province is the largest in Indonesia that reserved 2.4 billion ton.

3.5. Commodity in Sulawesi Corridor

In term of food crops, two provinces have the commodity of rice and corn. Gorontalo has the potential in maize, while South Sulawesi has the potential for both rice and corn. Moreover, plantation crops divided into coconut and cocoa. Coconut located on North Sulawesi and Central Sulawesi. The total production of North Sulawesi in 2015 is about 284,100 ton and ranked second in national production. The cocoa commodity is located at Southeast Sulawesi, Central Sulawesi, and West Sulawesi. Three

provinces are the main contributor for domestic markets with total production more than 300,000 ton of cocoa.

The corridor has natural resources about the fishery. However, the total output still far from expectation and might be improved. The fishery located in Gorontalo, North Sulawesi, and Central Sulawesi. While, aquaculture based in Southeast Sulawesi, South Sulawesi, and West Sulawesi.

3.6. Commodity in Bali – Nusa Tenggara Corridor

Bali has a fishery and water tourism. The fishery sector has a production capacity of about 118,242 ton. The province also has the potential for tuna, lemuru, and cob. On the other hand, West Nusa Tenggara has the potential in rice and soybean for food crops and aquaculture for the fishery. Last, East Nusa Tenggara has the potential for economic development in cassava and sweet potato for food crops, cow, and buffalo in term of animal husbandry.

3.7. Commodity in Papua – Maluku Corridor

Maluku is known for its fishery with production capacity for about 1 million ton per year. North Maluku has the coconut for the province potential. The production capacity ranked fourth in national level. West Papua has the commodity in fishery and forestry. Last, Papua has mining sector as their primary commodity which produces gold and copper. Gold and copper production in the province estimated about 34.9 ton and 455,860 ton per year respectively.

3.8. Corridor Characteristics

Each potential sub-sector from every corridor will be evaluated by using GRDP value and the GRDP distribution. The highest percentage of them shall be selected as the focus of industry on a region. In Sumatera corridor, plantation crops are the highest value of GRDP with 38.29% of the distribution. It follows by oil, gas and geothermal and foods plants by 32.94% and 14.15% respectively. Furthermore, in selecting the most potential commodity in a subsector, it must reach a 30% from the total of national production. From eight commodities, only six that qualified for the focus of development. It consists of coconut, palm, rubber, sugar cane, coffee, and pepper.

For Java corridor, Information and communication select as the corridor characteristic. The percentage is about 20.06%, surpassing food and beverages (18.24%) and transportation (13.85%). As the ICT unable to be divided into smaller components, the corridor shall focus on the technology gap, problems identification, and the need for supporting infrastructure mainly hardware and software to achieve the targeted corridor as National Cyber Technology Innovation and Services Center Corridor. Kalimantan corridor will focus on coal and lignite mining as the main characteristics. The GRDP distribution for the sub-sector is about 73.38%. The problem on the commodity no longer about the quantity but quality of the output. More than 60% of coal in Kalimantan produce a 5,100 – 6,100 kkal/kg or equal to medium quality and a maximum of 15% that shows a high quality. Thus, improvement for coal treatment shall be conducted.

On Sulawesi Corridor, fishery and plantation crops generate close gap of GRDP contribution for about 35.66% over 35.14%. The analysis shows that aquaculture is more beneficial and potential for development. It consists of marine-culture, aquaculture, and inland water aquaculture. Accommodation, foods, and beverages are the most potential sub – sector in Bali – Nusa Tenggara corridor by 39.38% of GRDP contribution. This sub – sector is closely related to the tourism. The further evaluation shall be conducted by considers the type and location of leading tourism, problems, and related infrastructure. The theme of this Corridor is the National Ecotourism Center Corridor.

Papua – Maluku corridor selects iron ore mining as the corridor characteristic by a significant GRDP distribution. By taking into account of the current state of enormous natural resources in the region, the potential commodity remains copper and gold. The detail for characteristic on each corridor can be seen in Table 8.

Table 8. The Evaluation Summary of Corridor Characteristics.

Corridor	Subindustry	Commodity
Sumatera	Plantation Crops	Coconut, Palm, Rubber, Sugar Cane, Coffee, Pepper
Java	Information and Communication	Hardware and Software
Kalimantan	Coal and Lignite Mining	Coal and Lignite
Sulawesi	Fishery	Aquaculture Fishery
Bali - Nusa Tenggara	Accommodation and Food Services Activities	Water – based Tourism
Papua - Maluku Island	Iron Ore Mining	Copper and Gold

The following figure demonstrates the theme for each corridor by considers the potential of economic and industrial development in regions.

**Figure 1.** Indonesia Economic Corridor Development Plan.

4. Conclusion

As industrial development becomes one of the highest contributing factors to the economic growth, the country should evaluate the concept for each corridor. Currently, the country categorizes industrial development into six economic corridors from Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Maluku.

According to this research, the potential sub – industries in each corridor can be determined. Sumatera corridor focus on plantation crops consists of six commodities such as coconut, palm, rubber, sugar cane, coffee, and pepper. Java corridor focuses on information and communication industry not only the hardware but also the software. Kalimantan corridor mainly focuses on coal and lignite mining. Sulawesi corridor focuses on aquaculture. Bali-Nusa Tenggara corridor focuses on tourism mainly water – based tourism, and Papua-Maluku corridor focus on iron ore mining such as copper and gold.

5. Acknowledgements

The research is fully supported by a grant from Universitas Indonesia. Authors also wish to thank all experts for the input and constructive discussion.

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