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AN ANALYSIS OF THE DEVELOPMENT OF THE INDUSTRIAL ESTATES FROM THE LEADING ECONOMIC SECTORS DUE TO THE POTENTIAL INCREASE IN USAGE OF THE TRANS SUMATERA TOLL ROAD: A CASE STUDY OF THE NORTHERN SUMATERA REGION

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Abstract: In order to increase economic growth, the Government of Indonesia is making efforts to accelerate infrastructure projects, one of which is the Trans Sumatera Toll Road. This is expected to help increase economic growth and connectivity on the Sumatera island. Sumatera Island is an area that has abundant natural resource potential. However, this potential has not been fully developed by considering the construction of the Trans Sumatera Toll Road. This study aims to develop a leading sector-based industry in the Northern Sumatera Region to increase the potential use of the Trans Sumatera Toll Road. Determination of industrial focus is carried out using location quotient analysis by considering regional development indicators in the form of Gross Regional Domestic Product distribution, sector potential and the Human Development Index. Estimated initial cost required is calculated by benchmarking approach and price survey. The results show that the development of leading sector-based industries in the Northern Sumatera Region is estimated to require initial costs of USD 1,025.53 million for the rice processing industry, integrated coconut processing, food processing, and palm oil processing. The results of this study can be an input for the Indonesian government to increase the potential use of the Trans Sumatera Toll Road through industrial development of leading economic sectors in each region.

Keywords: Investment costs; Trans Sumatera Toll Road; Northern Sumatera region; Industrial development.

1. Introduction

In order to increase economic growth through infrastructure development in Indonesia, the Government of Indonesia is making efforts to accelerate projects that are considered strategic and have high urgency to be realized in a short period of time. The Committee for the Acceleration of Priority Infrastructure Provision explained that based on Presidential Regulation No. 56 of 2018 concerning amendments to Presidential Regulation No. 58 of 2017, it was decided that as many as 223 National Strategic Projects plus three programmes, namely the electricity programme and aircraft industry programmes as well as economic equality was included, with a total investment value of USD 268.141 billion (1 USD ≈ IDR 15,600.00) (The Committee for the Acceleration of Priority Infrastructure Provision, 2019).

This National Strategic Project is expected to contribute to increase national economic growth by increasing economic growth and community welfare in each region around the project. In Presidential Regulation No. 109 of 2020, there are 201 National Strategic Projects classified into 12 sectors, namely the road and bridge sector, ports, airports, trains, areas, housing, dams and irrigation, clean water and sanitation, coastal embankments, energy, technology, and the education sector. There are 7 development agendas that are adapted to Indonesia's vision 2045, namely strengthening economic resilience for quality and equitable growth; development of territories to reduce inequality and ensure equity; improvement of qualified and competitive human resources; support economic development and basic services by strengthening infrastructure; improving disaster resilience, climate change, and building the environment; and strengthening the stability of Polhukhankam (political, law, defence and security affairs) and the transformation of public services. The purpose of infrastructure development is to connect production areas with distribution areas, facilitate access to tourist areas, boost new jobs, and accelerate the increase in added value of the people's economy (Indonesian Ministry of National Development Planning, 2019).

One of the National Strategic projects is the Trans Sumatera Toll Road (TSTR). The TSTR is an infrastructure mega project that will improve the connectivity of the Sumatera island by connecting eight provinces, namely Aceh, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, and Lampung provinces with seven capitals, five airports and six large ports and with the length of 2,704 km. This project is one of the Major Projects or Strategic Priority Projects launched in the National Medium-Term Development Plan 2020-2024. This is intended to provide benefits in the form of reducing the travel time needed from Lampung

province to Aceh from 48 hours to 30 hours. Besides, it also helps the development of industrial and tourism areas for the Sumatera island.

Sumatera Island is the island with the second fastest economic growth after Java and is one of the largest islands owned by Indonesia with an area of around 473,481 km^2. The potential for abundant natural resources and strategic location supports the island's rapid economic activities. With the high economic activity, it is necessary to provide adequate infrastructure so that it can support the smooth running of the economic activity. Vice versa, the existence of adequate infrastructure can be a trigger to develop the economy in the area. Inadequate basic infrastructure such as poor road conditions, old and damaged railways, lack of sea port efficiency and inadequate electrical power, industrial development on this island is hampered (Sosilawati et al., 2017).

Nanggroe Aceh Darussalam Province (Aceh) is the northernmost province of the island. The agriculture, forestry and fisheries sectors, as well as mining and quarrying are some of the mainstay sectors of the region. North Sumatera Province is a province that is only directly connected to Nanggroe Aceh Darussalam Province through land access. For its economic aspect, this province is very dependent on the connectivity of North Sumatera Province, because almost all the basic needs of the Acehnese are supplied through North Sumatera Province. The natural wealth owned by North Sumatera Province is mining products, forest products, and also agriculture and plantations (Sosilawati et al., 2017).

In regional development, it is necessary to consider the potential of each region. The Sumatera island has abundant natural resource potential. However, this potential has not been fully developed to enhance economic development in the region by considering the construction of the TSTR. In this study, industrial development of potential areas were carried out in the Nanggroe Aceh Darussalam and North Sumatera Provinces. The determination of this province is because Nanggroe Aceh Darussalam Province is very dependent on North Sumatera Province regarding land connectivity, and both provinces are traversed by the TSTR and are the northernmost area of the Sumatera island.

Therefore, this study aims to identify leading economic sectors in the Northern Sumatera Region, namely in Nanggroe Aceh Darussalam and North Sumatera Provinces using Gross Regional Domestic Product (GRDP) data and planning the development of industrial estates from selected leading economic sectors to increase the potential use of the TSTR.

2. Theoretical Review

2.1. Toll Road Infrastructure

The development of the TSTR was launched by the Indonesian government in order to encourage regional development and also provide solutions to transportation problems on the Sumatera island. This project was also initiated to improve connectivity, reduce logistics costs, increase investment, create jobs, and encourage sectoral growth so that industrial potential on the Sumatera island can be developed more competitively. The construction of the TSTR is contained in Presidential Regulation Number 100 of 2014 concerning the Acceleration of Toll Road Development in Sumatera which was signed on 17 September 2014. In the Presidential Regulation No. 100 of 2014, it is stated that as a first step, the construction of the TSTR project will be carried out on four toll road sections which include the Medan-Binjai Toll Road, Palembang-Sp Toll Road, Indralaya, Pekanbaru-Dumai Toll Road, and Bakauheni-Terbanggi Besar Toll Road (Government of The Republic of Indonesia, 2014).

2.2. Infrastructure and Economic Growth

Regional development and inter-regional connectivity can be encouraged by the construction of toll roads so that it can accelerate and expand economic development. This will also reduce transportation costs and logistics costs so as to increase product competitiveness and accelerate the economic cycle. The increase in economic activity that can cause changes in the pattern and structure of public consumption is also a benefit of the development of transportation infrastructure.

Regional development is a development aimed at developing the area. The infrastructure development plan is based on the development needs of the area. The following are some theories of regional development such as the Neo-Classical Theory of Growth; Neo-Keynes Growth Theory; Theory of Regional Inequality or Unbalanced Growth; Economic Base Theory; and Dependency Theory (Ministry of Public Works and Public Housing, 2017).

2.3. Overview of the Northern Sumatera Region

Nanggroe Aceh Darussalam Province or also can be called Aceh Province, has an area of 57,956 km^2. The province has 18 regencies and 5 cities, 289 districts, and 6,514 villages. Its

territorial boundaries are north and east bordered by the Strait of Malacca, south with North Sumatera Province, and west with Samudera Indonesia (Statistics Indonesia, 2021a). Based on the Aceh Development Plan 2023-2026, there are 4 areas designated as part of the Aceh strategic area development plan which includes:

(1) Aceh Trade and Distribution Center (ATDC) spread across 6 (six) zones. The development centers include:

a) Central Zone/Banda Aceh and its surroundings;

b) North Zone/Lhokseumawe and surrounding areas;

c) East/Langsa Zone and beyond;

d) Southeast Zone/Southeast Aceh and its surroundings;

e) South Zone/South Aceh and surrounding areas;

f) West/Southwest Aceh Zone and surrounding areas;

(2) Agro-tourism areas located in 17 regencies/cities;

(3) Historical site areas related to the birth of the Helsinki MoU between the Government of Indonesia and the Free Aceh Movement; and

(4) Special areas, where Aceh's potential and advantages are in agriculture, mining and tourism.

In accelerating economic growth and creating jobs, these potentials and advantages are developed through the development pattern of Special Economic Zones (SEZ), Industrial Estates, Tourism Strategic Areas, and Development of Strategic and Special Areas whose determination of place is adjusted to the potential of each region. (Aceh Provincial Government, 2022).

North Sumatera Province has a land area of 72,981.23 km^2. The province has 25 regencies and 8 cities, 450 districts, and 6,132 villages. The boundaries of this province are the north bordering Aceh Province, the east bordering Malaysia and the Malacca Strait, the south bordering Riau and West Sumatera Provinces, and the west bordering the Indian Ocean (Statistics Indonesia, 2021c). Based on the 2019-2023 North Sumatera Provincial Medium-Term Development Plan, the strategic areas in this province are the Bukit Barisan plateau agropolitan area; Simalungun – Batubara – Asahan Integrated Economic Development area; integrated economic development area of Labuhanbatu and its surroundings; the West Coast Integrated Economic Development area and beyond. These strategic areas could maximize the

potential for regional economic growth if there was an increase in connectivity such as the TSTR.

The other strategic areas in this province are the Nias Islands Integrated Economic Development area; historical sites and buildings in the urban area of Mebidangro; religious areas and temple/monastery sites in Padanglawas and North Padanglawas Regencies. There are also Bawomataluo Traditional area of South Nias Regency and its surroundings; religious areas and historical sites in Barus, Central Tapanuli Regency; religious areas and historical sites of the Batak tribe in Pusuk Buhit. The rest of the strategic areas are the Leuser and Bahorok Ecosystem areas; the Batang Toru Forest Conservation area; the Batang Gadis National Park Conservation area, Mandailing Natal Regency; and the Sinabung and Sibayak Volcano Disaster Prone areas (North Sumatera Provincial Government, 2019).

2.4. Industrial Estate Development

Indonesia's industrial performance tested by the United Nations Industrial Development Organization (UNIDO) is ranked 38th out of 150 countries based on its industrial performance evaluation. Measured by the competitive industrial performance index, Indonesia has a score of 0.08, as shown in **Figure 1**. This score is still very low compared to Singapore (0.259), Malaysia (0.156) and Thailand (0.142). Indonesia is also ranked 38th, Singapore is ranked 9th, Malaysia is ranked 23rd, and Thailand is ranked 24th. Malaysia belongs to the category of developed countries along with other developed countries such as China, Japan, the United Kingdom, Australia, Germany and Spain (United Nations Industrial Development Organization, 2018).

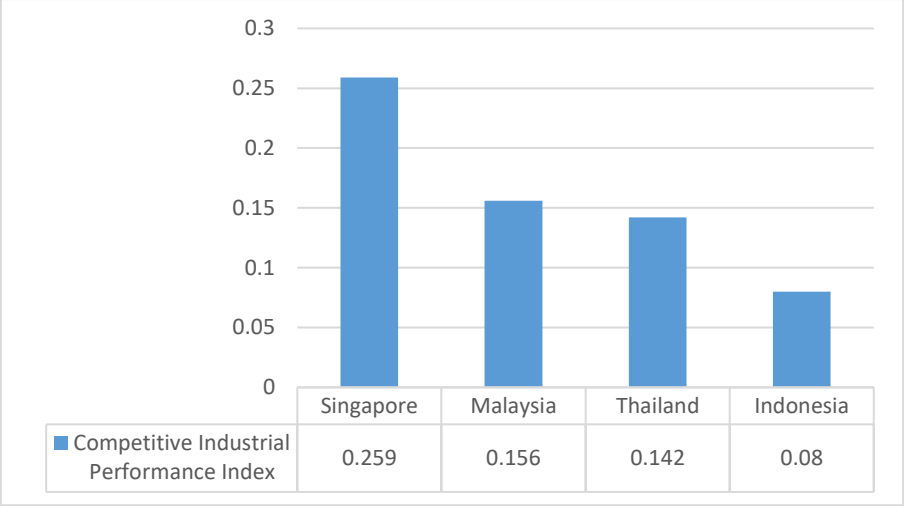

Figure 1. Competitive industrial performance index for the Southeast Asia countries in 2016 (United Nations Industrial Development Organization, 2018)

Looking at one of the indicators, namely the ratio of manufacturing exports to total exports, Indonesia has a score of 68.86%. This value is lower than other Southeast Asia countries such as Singapore (89.36%), Thailand (88.76%), Vietnam (86.81%), Malaysia (85.5%), the Philippines (90.42%), and Cambodia (93.82%), as shown in **Figure 2**. In terms of the ratio of exports of its manufacturing industry to the country's total exports, Indonesia is ranked in the bottom 4 after Brunei Darussalam, Laos and Myanmar. This indicates that Indonesia has not been able to optimize natural resources as abundant domestic raw materials (United Nations Industrial Development Organization, 2018).

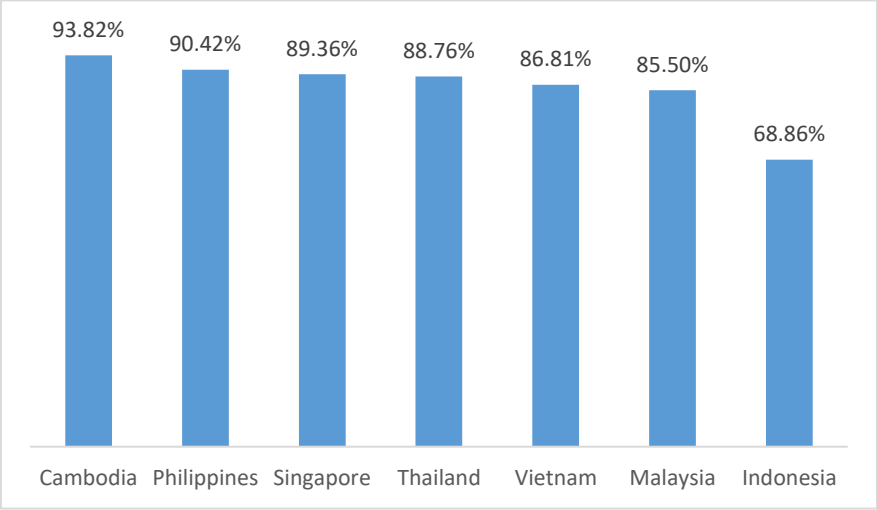

Figure 2. Ratio of manufacturing exports to total exports for the Southeast Asia countries in 2018 (United Nations Industrial Development Organization, 2018)

3. Research Methods

It was necessary to have a research strategy so that the results obtained can focus on the goals to be achieved. Several factors that influence the type of research strategy can arise from how the type of question being asked, how much control the researcher has over the behavioural events to be studied, and the focus of the research is a current phenomenon (Yin, 2014). For scientific research, it is necessary to have stages / sequences that are adjusted to the research framework that has been compiled in the form of a flowchart. A research flowchart was a hierarchy that explained how the flow of thinking was used during the research process. In this study, to achieve the research objectives, literature studies, GRDP analysis, industry selection, calculation of initial costs of industrial development, industrial site planning and in-depth interviews with experts were carried out. The series of research processes can be seen in the **Figure 3**.

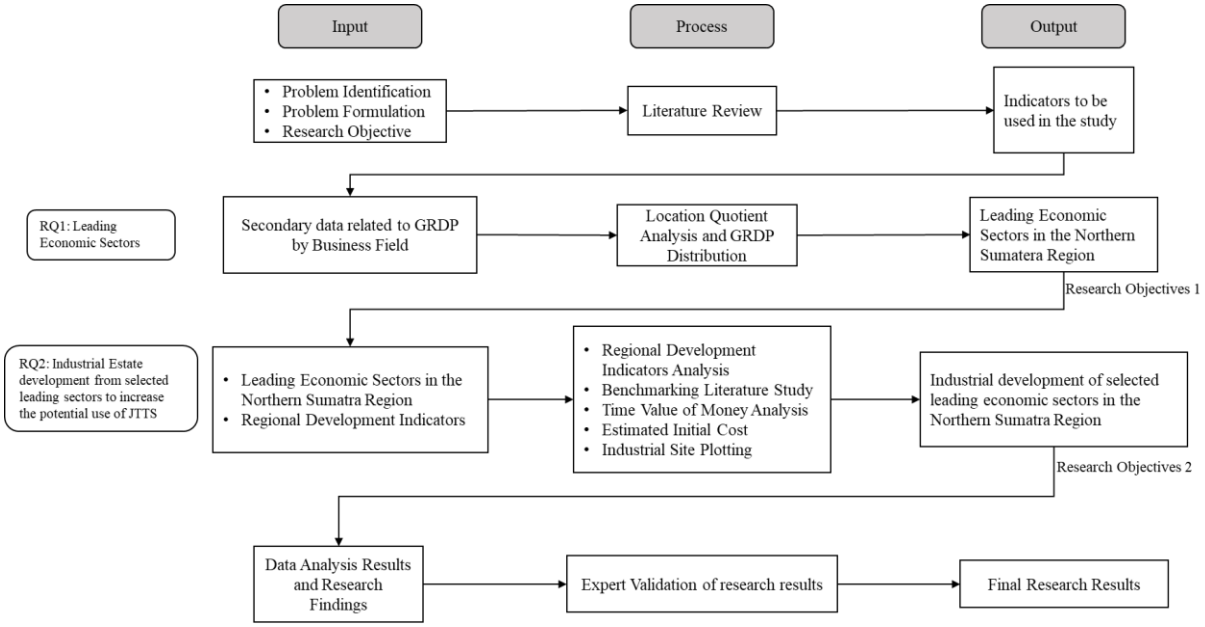

Figure 3. Research flowchart

The first stage of this research were carried out to identify the leading economic sector in two provinces located in the Northern Sumatera Region by analyzing GRDP data provided by the Statistics Indonesia. Location Quotient (LQ) analysis techniques are used to identify base sectors that have advantages (Tarigan, 2005). The value of the LQ coefficient ranges from 0 to infinity. If the LQ coefficient is < 1, then it can be interpreted that the sector / commodity does not have a comparative advantage. If the LQ coefficient = 1, then the sector is not the one with the privileges in an area. If the LQ coefficient is > 1, then it means that the sector in question

has a higher than average comparative advantage (Berawi et al., 2017). LQ was calculated using the formula:

$$LQi = \frac{ei/e}{Ei/E} \quad (1)$$

Where LQi = LQ value for sector i in the selected regency, ei = GRDP sector i in the selected regency, e = GRDP of all sectors in the selected regency, Ei = GRDP sector i in the Province of the selected regency, and E = GRDP of all sectors in the Province from the selected regency.

Then an analysis of the distribution of GRDP was carried out, which is one of the indicators of regional development, in the three sectors that were reviewed to see the contribution of the economic sector to regional income. From these results, one economic sector and leading subsectors were obtained that contribute greatly to the preparation of regional income, and were used for selection in the development of industrial estates.

In the second phase, an analysis of regional development indicators were carried out in the three previously selected economic sectors. The indicators used were the potential sector and the Human Development Index (HDI). Areas that have a very high HDI were not chosen to be industrial development locations because they are considered to have good human resources and economic growth rates. Then the selection of industries in the selected economic sector was carried out by selecting the commodities with the highest production. This is at the district level and then the results of the analysis were used to determine the number of factories to be developed using commodity productivity per year, factory production capacity and factory operational time.

After that, benchmarking was carried out for the focus of selected industries to be developed, namely the cost of equipment and machinery, land and building area used, as well as information about the cost of industrial investment. Then plotting industrial locations was carried out using Google Earth Pro. Factory location planning was carried out by mapping the TSTR in advance to facilitate the determination of industrial locations by estimating the closest distance of industrial locations to the TSTR. Then the calculation of the estimated initial cost of industrial development from selected leading economic sectors was carried out. After the research results were obtained, the author validated the research results to get views and responses on industrial development from selected leading economic sectors in the Northern Sumatera Region.

4. Research Results and Discussion

The first step in this stage is to identify the overall GRDP value at the regency and city levels in Nanggroe Aceh Darussalam and North Sumatera Provinces. This is done by ranking the GRDP value from the largest to the smallest to get the regency or city that has the highest GRDP value. Then 5 regencies or cities with the highest GRDP scores are taken to proceed to the next stage. After obtaining the 5 regencies or cities, the next stage is to calculate the LQ and analyze the distribution of GRDP from selected sectors to find out the potential of the area. After an analysis of the leading economic sectors, then an industry selection is carried out based on potential sector indicators and the Human Development Index.

Based on **Figure 4**, from the 23 regencies and cities in Nanggroe Aceh Darussalam Province, a ranking of the GRDP value was carried out to facilitate the selection of regencies or cities to be reviewed. The five regencies/cities that have the highest GRDP value are Aceh Utara Regency, Banda Aceh City, Aceh Besar Regency, Bireuen Regency, and Pidie Regency. For North Sumatera Province, from the 33 regencies and cities, five regencies/cities that have the highest GRDP value are Medan City, Deli Serdang Regency, Langkat Regency, Simalungun Regency, and Asahan Regency. There was a slight change in the city / regency rank when compared to previous research (Berawi et al., 2017), where Batubara Regency ranked fourth in terms of the highest GRDP value. The regency that has the highest GRDP value in Nanggroe Aceh Darussalam Province is Aceh Utara Regency with USD 1,262.48 million, while the first rank in North Sumatera Province is Medan City with USD 15,525.53 million.

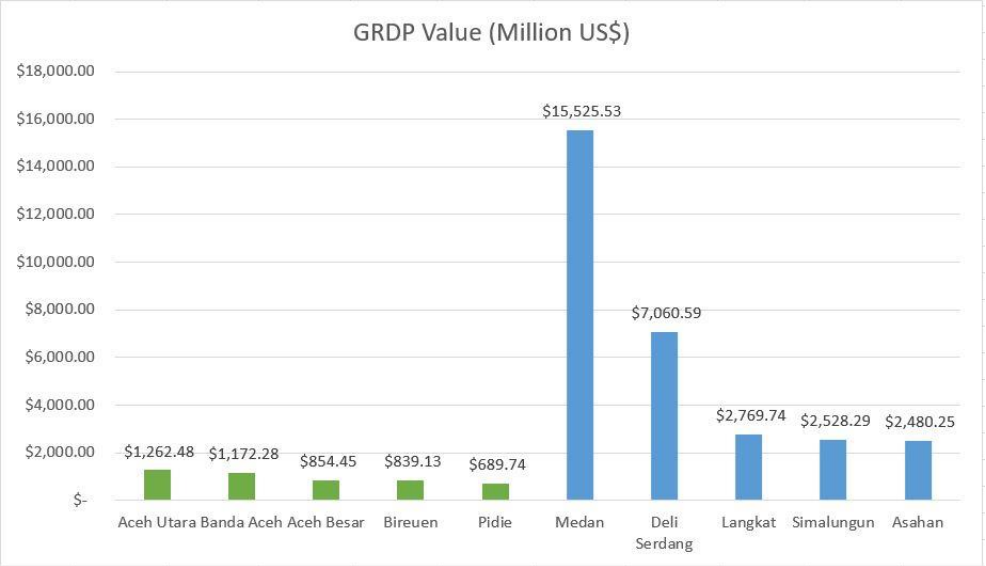

Figure 4. Highest GRDP of each region for the Northern Sumatera in 2020 (Statistics Indonesia, 2021a and Statistics Indonesia, 2021c)

From the five regencies/cities in each province, LQ calculations were then carried out, the results of which can be seen in **Figure 5** for Nanggroe Aceh Darussalam Province and **Figure 6** for North Sumatera Province. An example of LQ calculation is explained from the Agriculture, Forestry, and Fisheries sector in Aceh Utara Regency. From the data obtained, it is known that the GRDP value for the Agriculture, Forestry, and Fisheries sector in Aceh Utara Regency is USD 459.25 million; the GRDP value for the seventeen total economic sectors in Aceh Utara Regency is USD 1,262.48 million; the GRDP value for the Agriculture, Forestry, and Fisheries sector in Nanggroe Aceh Darussalam Province is USD 3,248.58 million; and the GRDP value for the seventeen sectors is USD 10,675.74 million. Thus, the calculation of LQ for the Agriculture, Forestry, and Fisheries sector is:

$$\frac{\text{USD 459.25 million} / \text{USD 1,262.48 million}}{\text{USD 3,248.58 million} / \text{USD 10,675.74 million}}$$

$$= \quad 1.195$$

From the calculation, the LQ value in 2020 for the Agriculture, Forestry, and Fisheries sector in Aceh Utara Regency was 1.195. This means that this sector is a base economic sector that can produce commodities that can be developed for export to various regions. The calculation of LQ for each of the five selected regencies/cities in Nanggroe Aceh Darussalam and North Sumatera Provinces is carried out in the same way.

As shown in **Figure 5**, the regency that has the highest LQ value in Nanggroe Aceh Darussalam Province is Aceh Utara Regency for the Mining and Quarrying sector with a value of 3.503, while in Banda Aceh City, it has a value of 0 for this sector.

As shown in **Figure 6**, the regency that has the highest LQ value in North Sumatera Province is Langkat Regency for the Mining and Quarrying sector with a value of 7.463, while in Medan City, it has a value of 0.001 for this sector.

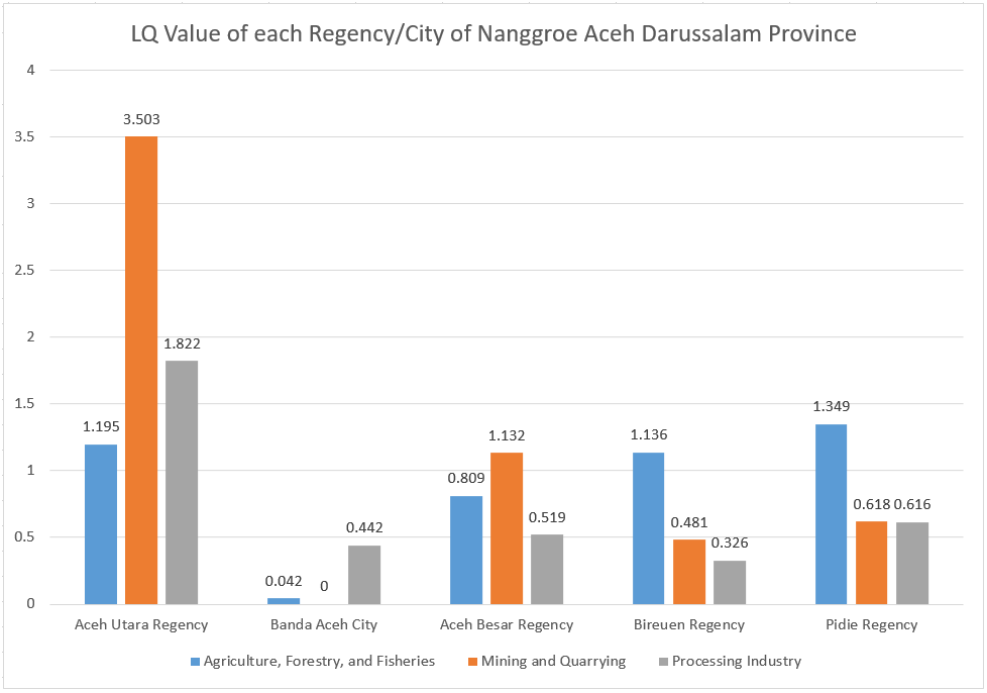

Figure 5. LQ value of each Regency/City of Nanggroe Aceh Darussalam Province in 2020

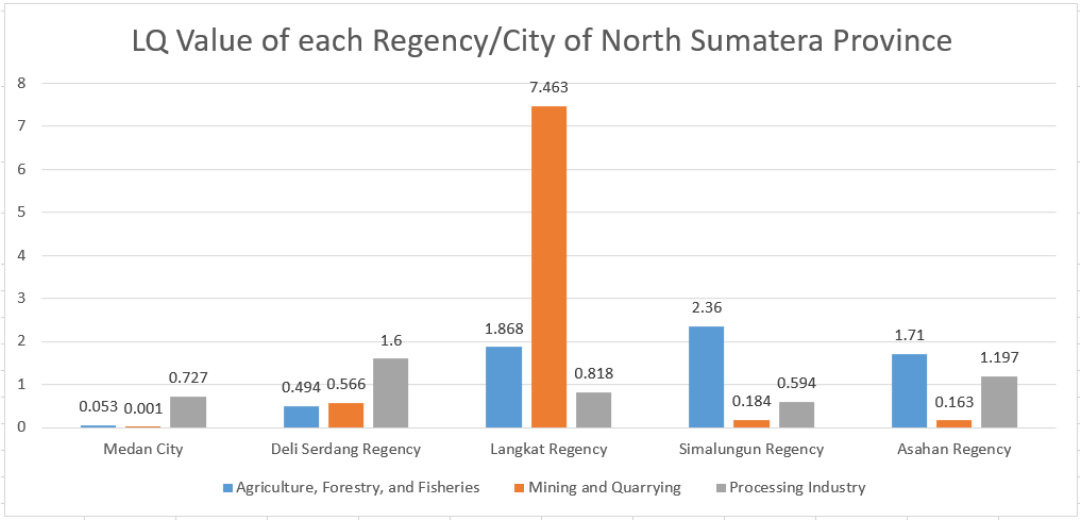

Figure 6. LQ value of each Regency/City of North Sumatera Province in 2020

Then an analysis of the distribution of GRDP was carried out which is expressed in the form of a percentage, and the economic sector that has the highest GRDP distribution was selected as the economic sector that will be used for raw materials for the processing industry. In **Table 1**, for Nanggroe Aceh Darussalam Province, the economic sectors selected are the agriculture, forestry, and fisheries sectors for the Regencies of Aceh Utara, Aceh Besar, Bireuen, and Pidie.

For Banda Aceh City, the chosen economic sector was the processing industry. In **Table 2**, for North Sumatera Province, the economic sector chosen was the agriculture, forestry, and fisheries sector for Langkat, Simalungun, and Asahan Regencies, while the processing industry is located in Medan City and Deli Serdang Regency. From **Table 1**, the highest GRDP distribution value in Nanggroe Aceh Darussalam Province is Pidie Regency for the Agriculture, Forestry, and Fisheries sector with a value of 41.06%. While in Banda Aceh City, the Mining and Quarrying sector has a value of 0.

Table 1. GRDP distribution of Regency/City of Nanggroe Aceh Darussalam Province

Regencies/Cities	GRDP Value (Million USD)	GRDP Distribution (%)			
		Agriculture, Forestry, and Fisheries	Mining and Quarrying	Processing Industry	Total Distribution
Aceh Utara Regency	1,262.48	**36.38**	15.76	8.45	60.59
Banda Aceh City	1,172.28	1.29	0	**2.05**	3.34
Aceh Besar Regency	854.45	**24.6**	5.09	2.4	32.09
Bireuen Regency	839.13	**34.57**	2.16	1.51	38.24
Pidie Regency	689.74	**41.06**	2.78	2.86	46.7

From **Table 2**, the regency that has the highest GRDP distribution value in North Sumatera Province is Simalungun Regency for the Agriculture, Forestry, and Fisheries sector with a value of 49.99%. While in Medan City, the Mining and Quarrying sector has a value of 0 with rounding. This shows that this sector hardly contributes regional revenue to the city.

Table 2. GRDP distribution of Regency/City of North Sumatera Province

Regencies/Cities	GRDP Value (Million USD)	GRDP Distribution (%)			
		Agriculture, Forestry, and Fisheries	Mining and Quarrying	Processing Industry	Total Distribution
Medan City	15,525.53	1.11	0	**14.12**	15.23
Deli Serdang Regency	7,060.59	10.46	0.7	**31.05**	42.21
Langkat Regency	2,769.74	**39.57**	9.22	15.89	64.68
Simalungun Regency	2,528.29	**49.99**	0.23	11.54	61.76
Asahan Regency	2,480.25	**36.22**	0.2	23.24	59.66

In **Tables 3** and **4**, an analysis of the Human Development Index indicators for both Provinces was carried out. According to the Central Statistics Agency, there are four categories in the

HDI assessment, namely Very High (HDI ≥ 80), High (70 ≤ HDI < 80), Medium (60 ≤ HDI < 70), and Low (HDI > 60) (Statistics Indonesia, 2021b). Therefore, Banda Aceh City will not be chosen as an industrial estate development area because it is considered to have a high quality of human resources. For North Sumatera Province, Medan City will also not be selected in the research focus.

As shown in **Table 3**, the city that has the highest average HDI value in Nanggroe Aceh Darussalam Province is Banda Aceh City with a value of 84.987%. This shows that Banda Aceh City as the capital of the province is already in a very high category based on the HDI.

Table 3. Human Development Index of Nanggroe Aceh Darussalam Province

Regencies/Cities	Human Development Index (%)			
	2018	2019	2020	HDI Average
Aceh Utara Regency	68.36	69.4	69.33	69.030
Banda Aceh City	84.37	85.18	85.41	84.987
Aceh Besar Regency	72.73	73.56	73.56	73.283
Bireuen Regency	71.37	72.17	72.28	71.940
Pidie Regency	69.93	70.58	70.63	70.380
Nanggroe Aceh Darussalam Province	71.19	71.96	71.99	71.713

Based on **Table 4**, the city that has the highest average HDI value in North Sumatera Province is Medan City with a value of 80.867%. This shows that Medan City as the provincial capital is already in a very high category based on the HDI.

Table 4. Human Development Index of North Sumatera Province

Regencies/Cities	Human Development Index (%)			
	2018	2019	2020	HDI Average
Medan City	80.65	80.97	80.98	80.867
Deli Serdang Regency	74.92	75.43	75.44	75.263
Langkat Regency	70.27	70.76	71	70.677
Simalungun Regency	72.49	72.98	73.25	72.907
Asahan Regency	69.49	69.92	70.29	69.900
North Sumatera Province	71.18	71.74	71.77	71.563

The selection of industries and their numbers to be developed around the TSTR can be seen in **Tables 5** and **6**. This is done by identifying the districts of each selected regency. In addition, it was necessary to identify the production and productivity (average) of a commodity produced

from the regency. Productivity was obtained by dividing the amount of commodity production divided by the land area of an area. An example of calculating the number of factory units to be developed is the Modern Rice Processing Industry in Aceh Utara Regency, Nanggroe Aceh Darussalam Province. There are 27 districts in Aceh Utara Regency, with a total rice production of 367,519.63 tons. The operational time of the factory to be developed is 300 days / year. The capacity of raw materials to be processed at the factory is 360 tons / day. Then the number of factories to be planned will be:

$$\frac{367{,}519.63\,\frac{tons}{year}\,x\,\frac{1\;year}{300\;days}}{360\;tons/day}$$

$$= \quad 3.403 \text{ unit}$$

So the number of factories for the modern rice processing industry to be built is 3 units, due to rounding down. The placement of factory locations is assumed to be placed in 3 districts with the highest productivity in Aceh Utara Regency. From **Table 5**, overall the leading economic sectors for Nanggroe Aceh Darussalam Province are the Agriculture, Forestry, and Fisheries sectors.

Table 5. Industrial selection in Nanggroe Aceh Darussalam Province

Regencies/Cities	Economic Sector	Industry Plan
Aceh Utara Regency	Agriculture, Forestry, and Fisheries	Modern Rice Processing Industry (3 factories) Palm Oil Processing Industry (1 factory)
Aceh Besar Regency	Agriculture, Forestry, and Fisheries	Modern Rice Processing Industry (2 factories) Integrated Coconut Processing Industry (1 factory)
Bireuen Regency	Agriculture, Forestry, and Fisheries	Modern Rice Processing Industry (2 factories) Integrated Coconut Processing Industry (1 factory)
Pidie Regency	Agriculture, Forestry, and Fisheries	Modern Rice Processing Industry (2 factories) Integrated Coconut Processing Industry (1 factory)

Based on **Table 6**, overall the leading economic sectors for North Sumatera Province are the Agriculture, Forestry, and Fisheries sectors. Only in Deli Serdang Regency which has the Processing Industry sector as its leading economic sector.

Table 6. Industrial selection in North Sumatera Province

Regencies/Cities	Economic Sector	Industry Plan
Deli Serdang Regency	Processing Industry	Food Processing Industry (1 factory)
Langkat Regency	Agriculture, Forestry, and Fisheries	Palm Oil Processing Industry (1 factory)
Simalungun Regency	Agriculture, Forestry, and Fisheries	Palm Oil Processing Industry (2 factories)
Asahan Regency	Agriculture, Forestry, and Fisheries	Palm Oil Processing Industry (5 factories)

In this study, the production year is not all in 2020. The data used was the last year's data in the book of the Statistics Indonesia in each regency. The total factories from industrial development to be built in the Northern Sumatera Region are 22 factory units consisting of 4 types of industries, as can be seen in Table 7.

Table 7. Number of industries in Northern Sumatera region

No.	Selected Industry Types	Number of Factory Units		Total
		Nanggroe Aceh Darussalam Province	North Sumatera Province	
1	Modern Rice Processing Industry	9	-	9
2	Integrated Coconut Processing Industry	3	-	3
3	Food Processing Industry	-	1	1
4	Palm Oil Processing Industry	1	8	9
Total Number of Factories				22

The calculation of initial costs was carried out with considerations such as land prices, construction prices, equipment and machinery prices, and taxes in the form of Land and Building Tax (L&B Tax) and Value Added Tax (VAT). The L&B Tax used is worth 10% (Christianto, 2021) and the VAT used is 11% (Darono, 2022). The estimated initial cost for the development of industrial estates in Nanggroe Aceh Darussalam Province is USD 360.57 million. As for North Sumatera Province, the initial cost is USD 664.95 million. Thus, the total initial cost for the development of industrial estates in the Northern Sumatera region is USD 1,025.525 million, as can be seen in Table 8.

Table 8. Initial cost of development of North Sumatera industrial estate

No.	Province	Industrial Initial Cost Value
1	Nanggroe Aceh Darussalam	USD 360.57 million
2	North Sumatera	USD 664.95 million
Total Industrial Initial Cost of Northern Sumatera Region		**USD 1,025.52 million**

After determining the location of the industry in each province, it is then combined into one map image, as can be seen in **Figure 7**. The location of industrial development in the Northern Sumatera region is in the area crossed by the TSTR. With the overall number of industries developed, it is expected to increase the potential use of the TSTR, especially regarding the transportation of goods and services.

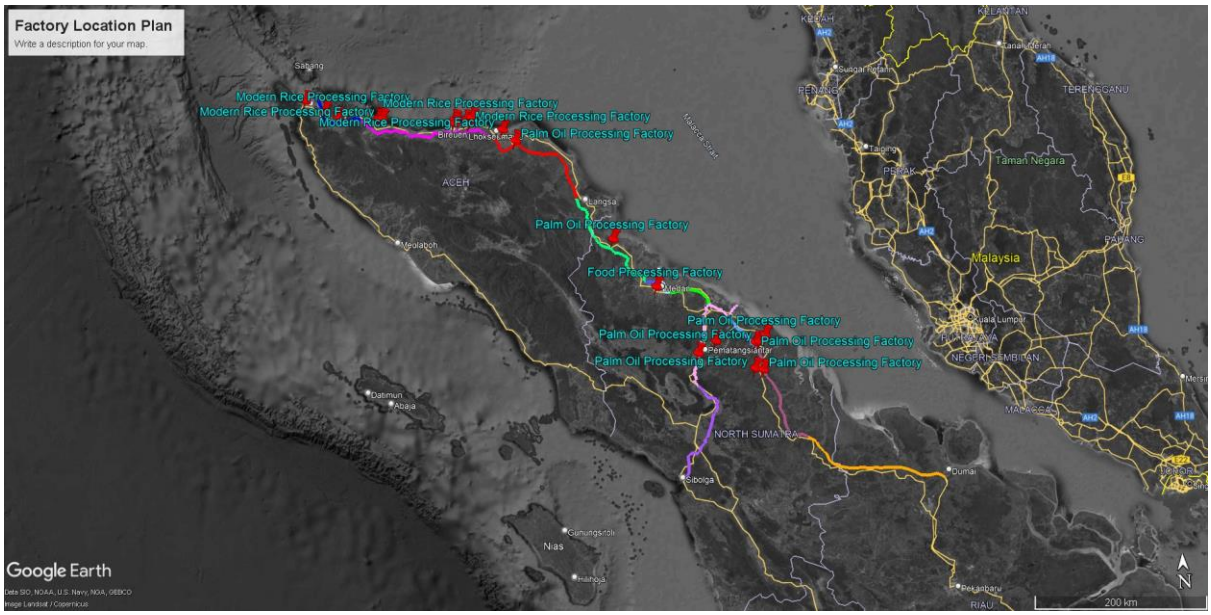

Figure 7. Factory location plan in Northern Sumatera

5. Conclusion

Based on the objectives of this study, it could be concluded that the leading economic sectors for the entire Northern Sumatera region include the agriculture, forestry, and fisheries sectors as well as the processing industry. The development of selected leading economic sector-based industrial estates established in the Northern Sumatera region has four types of industries, namely modern rice processing industries, palm oil processing, integrated coconut processing, and food processing. The number of factories planned to be built is 22 factories around the TSTR section with a total initial cost of USD 1,025.52 million. The factory location plan was

built based on the productivity of each commodity in the leading economic sector and the closest distance of the factory to the TSTR which was expected to be able to increase the potential use of the TSTR. The results of this study can be an input for the Indonesian government to increase the potential use of the TSTR through industrial development of leading economic sectors in each region.

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