

# Analysis of the Analytical Hierarchy Process Method to Prioritize the Development of Industrial Areas

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**Received : 21 August - 2025**

**Accepted : 23 September - 2025**

**Published online : 27 September - 2025**

## Abstract

The research analyzes the steps in prioritizing several alternative Industrial Estates among various provinces uses the Analytical Hierarchy Process (AHP), which provides an assessment in the form of criteria weights for each alternative according to existing criteria. The criteria used to prioritize the location of these Industrial Estates are based on Presidential Decree No. 26 of 2012 concerning the Blueprint for the Development of the National Logistics System, namely: Port Capacity, Provincial Minimum age, and Economic Growth Rate. In the beginning we give relative weight to each criterion in determining Industrial Areas based on information from the Investment Coordinating Board. This weighting is useful for creating a priority order for each criterion, and then continuing with calculating the Adjusted Matrix and Consistency Ratio. The same steps are applied by giving relative weights between the criteria for each alternative Industrial Area, which is the weighting is carried out according to a comparison of quantitative and qualitative data for each Industrial Area. The final step is to use the Original and Adjusted Matrix to multiply all the weights of the alternatives and their criteria. The calculation results indicate that the industrial estate in Central Sulawesi is the top priority for development, while the other alternative locations need to address existing deficiencies before being designated as major industrial estates. Based on the AHP analysis, Central Sulawesi is identified as the most favorable location for industrial estate development, while North Maluku and West Papua require further improvements to meet the criteria.

**Keywords:** Analytical Hierarchy Process, Industrial Estate Location, Eastern Indonesia.

## 1. Introduction

The Government of the Republic of Indonesia has developed a National Logistics System Framework (SISLOGNAS) and a Master Plan for the Acceleration and Expansion of Indonesia's Economic Development (MP3EI), which includes programs to improve Indonesia's logistics system and reduce logistics costs in Indonesia. The SISLOGNAS framework was developed to realize Indonesia's economic vision for 2025. Under President Joko Widodo, this framework has been incorporated into the Sea Toll Road development policy, aimed at supporting Indonesia's goal of becoming a Global Maritime Axis Nation by 2045.

SISLOGNAS is supported by Presidential Regulation No. 26 of 2012 concerning the Blueprint for the Development of the National Logistics System, which discusses the Indonesian government's strategic plan in the field of national logistics. One of the key issues discussed is the strategic plan for infrastructure improvement. One of the issues is the movement of goods from Java to Sumatra, and vice versa, where frequent congestion occurs at the Merak port due to the limited number of cargo ships, resulting in long queues. Thus, one of the main causes of high national logistics costs may be the inefficiency of the goods



movement system and the tax system. On the other hand, the congestion issue at Merak could present an opportunity for transportation service providers operating between Java and Sumatra.

In general, the objectives of SISLOGNAS are: to improve connectivity between Indonesian islands (through port access); to reduce logistics costs so that commodity prices (such as oranges, rice, onions, local beef, etc.) are not more expensive than imports (with the availability of raw materials); to create price parity between Eastern and Western Indonesia; and to encourage new economic growth centers.

So far, investment is concentrated in the western area of Indonesia, thus to support the equal development, investment should be pushed more to the eastern part of Indonesia. The longer investment in industrial areas in Eastern Indonesia is delayed, the longer it will take to achieve the goals of national logistics and equitable welfare. Otherwise, economic development gap in Indonesia will always arise. Some constraints that entrepreneur consider are the quality of human resources and infrastructure in eastern part of Indonesia are worse than those in the western part of Indonesia. Therefore, investment in east will not so beneficial. However, stakeholders -including academicians- should always notice the potential of economic development in all areas, so that prosperity will evenly be distributed for all people. To achieve this goal, we must put more attention for economic growth in eastern part of Indonesia that are still categorized as underdeveloped regions.

Economic growth in underdeveloped regions can be supported by the presence of industrial zones. Within the logistics system, location is a critical factor in optimizing total logistics costs and resource utilization. Location is relevant for both production facilities and warehouses, so this issue involves activities such as raw material reception, production, inventory storage, and the shipment of finished goods to consumers.

Most of the previous studies focused more on industrial estates in Java or Western Indonesia, so the effectiveness of priority location selection of industrial estates in Eastern Indonesia, such as North Maluku, West Papua, and Central Sulawesi, is rarely analyzed (Santoso et al., 2021). Although SISLOGNAS has been implemented, there has been little systematic evaluation of the relationship between industrial estate location selection and logistics cost efficiency in Eastern Indonesia (Saragih & Turnip, 2024). The different economic, resource and infrastructure characteristics of each eastern province are also rarely compared in the literature, so industrial investment decision-making has not been based on comprehensive analytical data (Vu et al., 2020). By considering these five aspects, this research aims to develop a model for selecting the location of industrial estates in Eastern Indonesia using the MCDA approach, which can contribute to strategic industrial planning while supporting national economic equity.

This paper discusses the decision-making process in selecting priority industrial estate locations in Eastern Indonesia in line with the SISLOGNAS program. The issue of industrial estates is an important issue in supporting product processing and supporting a balanced distribution system between Western Indonesia and Eastern Indonesia (Backhaul). The selected provinces are spread across three regions in Eastern Indonesia: North Maluku, West Papua, and Central Sulawesi. These provinces are chosen because they have strong capability and potential in industrial sectors among eastern Indonesia provinces. Indonesia government also encourage industrial investment on those provinces. Therefore, if Indonesia facilitates more industrial estate on those provinces, the impact will boost economic development for the surrounding areas. The benefits of this research for practitioners are that it can contribute to the strategic selection of alternative industrial zone locations. For academics, it serves as a

reference for further research on industrialization, particularly in exploring various criteria not yet discussed in this paper.

## 2. Literature Review

This location decision affects the company's business strategy, production and distribution capacity, and capacity expansion strategy (Yaşlıoğlu & Önder, 2016). To realize this Industrial Zone, investment and Break-Even Point (BEP) calculations are required. In other words, factory or warehouse facilities must be able to operate optimally for at least the period required to reach the BEP. Therefore, determining the location of facilities in Logistics is an issue for long-term objectives.

The location selection process is an important decision before the start of business and industrial activities in order to maximize profits for the industry (Mahmud et al., 2016). Once a location has been determined, it will be difficult for the company to find errors in the location determination process. This is because costs have already been incurred in the stage of analyzing and evaluating the advantages and disadvantages of each location. Moreover, if a facility has already been built and the analysis turns out to be inaccurate, then a poor facility location means high production and distribution costs, as well as poor access to raw materials, labor, and markets (Drezner & Hamacher, 2004). Additionally, the costs of a factory facility or industrial zone, which include fixed costs (such as investment in factory buildings and land, the cost of purchasing production machinery, and other equipment required to operate the industrial zone) and variable costs, are ultimately linked to the costs of transporting raw materials and distributing finished goods. A company's inability to manage all these costs effectively will result in a decline in its competitiveness (Yaşlıoğlu & Önder, 2016).

By choosing the right location, the existence of factory facilities (or industrial estates) will serve as the center of gravity for economic growth, driving income growth for the community in the area and involving various small and medium-sized businesses in the surrounding area. Additionally, the right location means optimizing the trade-off between logistics elements, which include: (Location) Facilities, (Reach) Transportation, and Inventory. To support this, access to the industrial zone location, raw materials, and transportation terminals must be available. For example, the availability of labor and natural resources near an industrial zone can optimize a company's performance in producing quality products. Furthermore, competent labor can effectively manage a facility, its operational costs, and inventory management. Therefore, a framework is needed to compare alternative facility locations for short-term and long-term purposes, aligned with the decision-makers' priorities.

## 3. Methods

This research uses the Analytical Hierarchy Process (AHP) method to determine the priority location of industrial estates by considering criteria relevant to the SISLOGNAS program, namely Port/Terminal Capacity, 2024 Provincial Minimum Wage (UMP), and 2021-2023 Economic Growth. Data for each criterion was obtained from official sources, such as BKPM and government documents, and verified to ensure accuracy and representativeness. The weight of the criteria is determined through the assessment of experts and relevant stakeholders, using pairwise comparison according to Saaty Scale, then the priority weight of each alternative is calculated and tested for consistency through Consistency Ratio (CR).

The research uses the Analytical Hierarchy Process (AHP) because it is a widely used method that structures problems into hierarchical levels based on the criteria of each available

alternative (Mangla et al., 2015). The steps are as follows: First, identify the objectives, alternative options, and define the evaluation criteria to prioritize the alternatives. Second, establish the decision hierarchy. Third, create a comparison matrix using available information, along with weights and priorities. Fourth, calculate the Consistency Ratio (CR). If the CR is less than 0.1, it indicates that the weighting and evaluation are consistent.

AHP method helps decision-makers handle complex issues., helping them focus on each component or criterion in decision-making and the link between those criteria. The AHP framework indeed supports structuring and simplifying complex problems into hierarchical levels of alternatives and criteria (Canco et al., 2021).

Furthermore, when there is a group of people or decision makers who have different views on an issue, the AHP method is able to facilitate these different views into a model that accommodates different views, as well as the influence between these criteria (Okfalisa et al., 2021). These perspectives are then translated into quantitative terms to achieve consensus among them. Thus, the AHP method serves as a tool to anticipate potential biases in evaluations (Dey et al., 2017).

Thus, the AHP method is able to respond to diverse interests when various stakeholders have different perspectives and experiences. The goal is to obtain weights or priorities for all criteria (Rahardja, 2020). Weights are given relatively as a comparison of the level of importance between alternative criteria in one alternative. These weights follow the following Saaty Scale:

**Table 1. Saaty Scale**

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate Importance	Experience and judgment slightly favor one over another
5	Strong Importance	Experience and judgment strongly favor one over another
7	Very Strong Importance	An activity is strongly favored and its dominance is demonstrated in practice
9	Absolute Importance	The importance of one over another affirmed on the highest possible order
2,4,6,8	Intermediate Values	Used to represent compromise between the priorities listed above

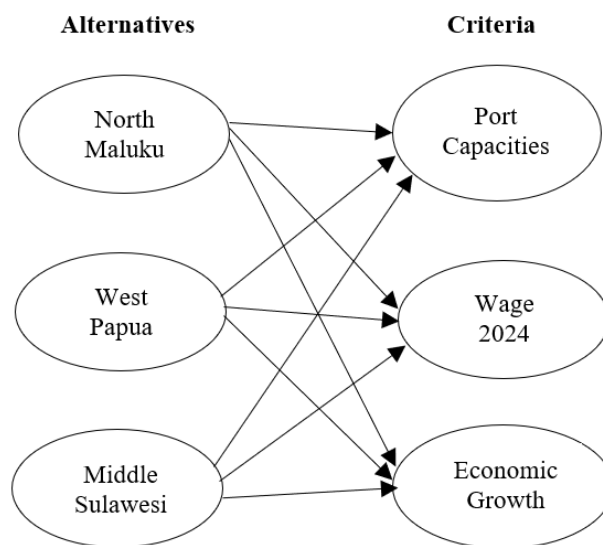
By providing relative assessments based on Intensity of Importance, the AHP method supports a framework for prioritizing and ranking based on pre-established criteria. This is done through pairwise comparisons, where decision-makers compare each alternative based on its level of importance (Lidyawati et al., 2024). This step supports us in making decisions on complex issues (Okfalisa et al., 2021).

Finally, the AHP method supports a fairly good process in making decisions when there are inconsistencies in assigning weights between criteria (Botelho, 2022). In the AHP method, a consistency test needs to be carried out to detect the level of consistency of the relative values or weights assigned. This consistency level indicates whether the evaluator assigns relative weights/values among various criteria in a sufficiently objective manner and without contradiction. For example: Alternative A is rated six times better than Alternative B ( $A = 6B$ ), and Alternative C is rated three times better than Alternative B ( $C = 2B$ ). Therefore, alternative A should be assigned a weight three times better than C ( $= 6B/2B$ ). Thus, it is evident that the AHP method facilitates consistent evaluation in assessing the process that has been conducted from the outset (Putra, 2023).

## 4. Results and Discussion

### 4.1. Analysis of Industrial Estate Location Prioritization with AHP Method

The initial step in prioritizing industrial zone alternatives is the first step in applying the AHP method. The criteria selected are tailored to the issues in SISLOGNAS. The purpose of the following calculations is to create a priority ranking as input for developing industrial zone locations. The criteria used are based on Presidential Regulation No. 26 of 2012 on the National Logistics System Development Blueprint, namely: Port/Terminal Capacity, Provincial Minimum Wage (UMP) 2024, and Economic Growth from 2021 to 2023. The provinces considered as alternatives for industrial zone development are North Maluku Province, West Papua Province, and Central Sulawesi Province. The relationship between the three alternative provinces and all criteria is illustrated as follows:



**Figure 1. Relationships between Alternatives and Criteria**

Then collect data to support decision making. The information used as a reference in assigning weights refers to data obtained from the Investment Coordinating Board in Table 2.

**Table 2. Information for each Criteria**

Province Alternatives	Port Capacities / Terminal	Minimum Wage 2024 (Rp)	Average Economic Growth 2021-2023 (%)
North Maluku	Port of Ternate (48.000 TEUs)	3.200.000	$(16,79 + 22,94 + 20,49) / 3 = 20,07$
West Papua	Terminal of Sorong (243.000 TEUs)	3.393.000	$(-0,51 + 2,01 + 3,91) / 3 = 1,80$
Central Sulawesi	Terminal of Donggala (170.000 ton / year), if 1 TEUs = 2,5 ton, then 170.000 / 2,5 = 68.000 TEUs	2.736.698	$(11,68 + 15,22 + 11,91) / 3 = 12,94$

From the information in Table 2, we can create an Original Matrix that shows the relative weights of the criteria. If a criterion is considered more attractive, more promising, or more promising to be developed as an Industrial Estate than other criteria, then that criterion is given a value greater than 1 (between 3 and 9 according to Table 1), for example a value of 5.



Conversely, criteria deemed less attractive are assigned the inverse value, i.e., one divided by five. After obtaining all the relative comparison values, we sum the total values for each column.

**Table 3. Scores among Criteria**

	Port Capacities / Terminal	Minimum Wage 2024 (Rp)	Average Economic Growth 2021-2023
Port Capacities / Terminal	1	1/5	1/3
Minimum Wage 2024 (Rp)	5	1	3
Average Economic Growth 2021-2023	3	1/3	1
<b>Total</b>	9 (= 1 + 5 + 3)	1,53	4,33

The total score for the Port/Terminal Capacity criterion = 1 + 5 + 3 = 9. The same calculation method is applied to the other two criteria. Then, the results in Table 3 are processed into an Adjusted Matrix. In the Adjusted Matrix, the values in each cell in Table 3 are divided by the total value in each column. After obtaining the new values for all cells, we calculate the average value of each row to obtain a Priority Weight. As a validation of the calculation, we sum the values of each column, which should equal 1.

**Table 4. Adjusted Matrix among criteria**

	Port Capacities / Terminal	Minimum Wage 2024 (Rp)	Average Economic Growth 2021-2023	Priority Weight
Port Capacities / Terminal	0,11 (= 1/9)	0,13 (= 1/5 / 1,53)	0,08	<b>0,11</b> (= (0,11 + 0,13 + 0,08) / 3)
Minimum Wage 2024 (Rp)	0,56	0,65	0,69	<b>0,63</b>
Average Economic Growth 2021-2023	0,33	0,22	0,23	<b>0,26</b>
<b>Total</b>	1 (= 0,11 + 0,56 + 0,33)	1	1	1

Then, to assess the consistency of relative weight assessments between criteria, the Consistency Ratio (CR) equation is used. In principle, if the CR value is 0.1 or less, the assessment is considered consistent. The CR calculation is applied to all criteria. The CR is calculated as follows: the total value of each criterion in Table 3 is multiplied by the priority weight of each related criterion in Table 4. For example, for the Port Capacity criterion, the calculation is  $(9 \times 0.11) + (1.53 \times 0.63) + (4.33 \times 0.26) = 3.06$ . This value is used to calculate the Consistency Ratio (CI) as follows:

$$\begin{aligned}
 CI &= \frac{\lambda - n}{n - 1} \\
 &= \frac{3,06 - 3}{3 - 1} \\
 &= 0,03
 \end{aligned}$$

This CI value is divided by the Random Index (RI), and the Consistency Ratio (CR) is obtained.

**Table 5. Consistency Ratio (CR) calculation using CI and Random Index (RI)**

N	RI
2	0
3	0.58
4	0.9
5	1.12

Looking at the value in Table 5, we can calculate the Consistency Ratio (CR) as follows :

$$CR = \frac{CI}{RI}$$

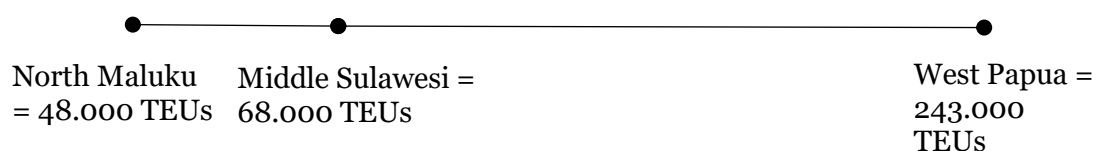
RI = 0.58 because N = 3 (number of alternatives)

$$CR = \frac{0,03}{0,58} = 0,05$$

The result for Consistency Ratio (CR) among criteria is 0,05, which is below 0,1. This indicates acceptable consistency for all given relatives scores among criteria in Table 3. This also means that there is logical approach and reliable enough to continue the AHP method to provide the most optimal result.

The steps in creating the Original Matrix, Adjusted Matrix, and CR are applied to all criteria with relative scores between Industrial Zone Province Alternatives. The consideration for assigning relative scores refers to qualitative information obtained from BKPM (see Table 2).

From Table 2, it also can be seen that the Port/Terminal Capacity in West Papua Province is far above the other two alternative provinces. If we illustrate the comparison of the scope of Port/Terminal Capacity among the three provinces, we obtain the following:



**Figure 2. Comparison of Port/Terminal Capacity across three provinces.**

Thus, in relative terms, the capacity of ports/terminals in West Papua is approximately five times that of ports/terminals in North Maluku, and the capacity of ports/terminals in Central Sulawesi is approximately 1.5 times that of ports/terminals in North Maluku. Given this consideration, the score for the port/terminal capacity of West Papua is five times that of the port/terminal capacity of North Maluku. The relative score for the port/terminal capacity of Central Sulawesi is twice that of the port/terminal capacity of North Maluku. Thus, the relative score for the port/terminal capacity in North Maluku compared to the port/terminal capacity in West Papua is 1 divided by 5 ( $= 1/5 = 0.2$ ). The results of the score calculation and Adjusted Matrix for the port/terminal capacity criterion can be seen in Table 6 and Table 7.

#### 4.2. Minimum Wage Criteria

The scores for Minimum Wage Criteria are given based on relative level of wage among alternative provinces. From Table 2 we see that the difference between the highest and the lowest wage is about 20% difference. It doesn't mean the score gap is around 20%. The minimum wage represents the monthly wage for one employee, thus we can imagine the total difference when we calculate the total wage for all employee for one year. Based on this perception, there is desired level of importance among scores for alternative provinces.

**Table 6. Minimum Wage 2024 Rate among Alternatives**

	North Maluku	West Papua	Central Sulawesi
North Maluku	1	2	1/2
West Papua	1/2	1	1/5
Central Sulawesi	2	5	1
Total	3,50	8,00	1,70

**Table 7. Adjusted Matrix for Minimum Wage 2024 among Alternatives**

	North Maluku	West Papua	Central Sulawesi	Priority Weight
North Maluku	0,29	0,25	0,29	<b>0,28</b>
West Papua	0,14	0,13	0,12	<b>0,13</b>
Central Sulawesi	0,57	0,63	0,59	<b>0,59</b>
Total	1	1	1	1

Using the same considerations as for scoring the Port/Terminal Capacity Criteria, the following scores and Adjusted Matrix results were obtained for the Minimum Wage in 2024 and 2021-2023 Average Economic Growth criteria.

#### 4.3. Port Capacities Criteria

The relative scores for port capacities shows how interesting the capacity of one port compared to the capacity of other ports. The importance level means that there is more capacity available in a port compared to other ports.

**Table 8. Port Capacities Rate among Alternatives**

	North Maluku	West Papua	Central Sulawesi
North Maluku	1	1/9	1/2
West Papua	9	1	5
Central Sulawesi	2	1/5	1
Total	12	1,31	6,50

**Table 9. Adjusted Matrix for Port Capacities among Alternatives**

	North Maluku	West Papua	Central Sulawesi	Priority Weight
North Maluku	0,08	0,08	0,08	<b>0,08</b>
West Papua	0,75	0,76	0,77	<b>0,76</b>
Central Sulawesi	0,17	0,15	0,15	<b>0,16</b>
Total	1	1	1	1

#### 4.4. Economic Growth Criteria

The scores of economic growths for all provinces shows how promising a province for future development. The higher the growth rate, the higher the scores, because a higher growth rate represents a more favor situation for decision maker.

**Table 10. Economic Growth Rate Score among Alternatives**

	North Maluku	West Papua	Central Sulawesi
North Maluku	1	7	2
West Papua	1/7	1	1/3
Central Sulawesi	1/2	3	1
Total	1,64	11	3,33



**Table 11. Adjusted Matrix for Economic Growth Rate Criteria among Alternatives**

	North Maluku	West Papua	Central Sulawesi	Priority Weight
North Maluku	0,61	0,64	0,60	<b>0,62</b>
West Papua	0,09	0,09	0,10	<b>0,09</b>
Central Sulawesi	0,30	0,27	0,30	<b>0,29</b>
Total	1	1	1	1

For the Consistency Ratio for all Criteria calculations, consistent results ( $CR < 0.1$ ) were obtained as follows:

**Table 12. Consistency Ratio for all Criteria**

Criteria	Consistency Ratio (CR)
Port Capacities	0,01
Passed by Regional Port	0,01
Economic Growth Rate	0,00

After obtaining a CR result of less than 0.1 for each criterion, we perform the final step, which is to prioritize the location alternatives using the Overall Weight of the Alternatives.

**Table 13. Overall Weight of the Alternatives**

Scores among criteria	Criteria 1 (Table 9) <b>0,11</b> (Table 4)	Criteria 2 (Table 7) <b>0,63</b> (Table 4)	Criteria 3 (Table 11) <b>0,26</b> (Table 4)
North Maluku	0,08	0,28	0,62
West Papua	0,76	0,13	0,09
Central Sulawesi	0,16	0,59	0,29
Total	1,00	1,00	1,00

From the result in table 13 above, we can see that each alternative becomes the first ranked on different criteria. North Maluku provinces are the most favorite for Economic-Growth criteria, West Papua provinces for Port-Capacities criteria, and Central Sulawesi for Minimum-Wage criteria. There is no alternative that superiors the others in all of the three criteria. The calculation could show that each alternative has advantage in its own way and one might guess that the final result might show a tight score. However, AHP method also gives priority among criteria, which means that the alternative that superior in the most favorable criteria might become the first priority compared to other alternatives.

The final step in prioritizing alternatives is to multiply the Priority Weights in the Adjusted Matrix by the Priority Weights in Table 4 (Adjusted Matrix between Criteria). The results of the multiplication are as follows:

0,08	0,28	0,62	X	0,11	=	0,34	North Maluku
0,76	0,13	0,09		0,63		0,19	West Papua
0,16	0,59	0,29		0,26		0,47	Central Sulawesi

The final score for North Maluku Province is the total result of the following multiplication:

$$0,08 \times 0,11 = 0,0088$$

$$0,28 \times 0,63 = 0,1764$$

$$0,62 \times 0,26 = 0,1612$$

This results in a final score for North Maluku Province equals to:

$$0,0088 + 0,174 + 0,1612 = \mathbf{0,34}$$

Similarly, for the other two provinces, the same calculation was applied, resulting in Central Sulawesi Province obtaining the highest score as a priority for industrial zone development. The second and third positions were occupied by North Maluku Province and West Papua Province, with scores of 0.34 and 0.19, respectively.

The final result indicates that Central Sulawesi Province is the most favorable alternative, even though it only has one favorable criteria that is superior to other alternatives, it is the minimum wage. Meanwhile, for two other criteria, Central Sulawesi province is on the second and third rank, they are economic growth and port capacities, respectively. This could happen because the minimum-wage criteria are the most favorable criteria among all three criteria. This suggests that UMP is the most decisive criterion in investment decisions, in line with the findings of (Judijanto, LosPrihanto & Bunyamin, 2025) which states that competitive labor costs attract investors in labor-intensive industries, and (Wicaksono et al., 2025) which shows a positive relationship between UMP and employment in labor-intensive sectors. However, economic growth is still important because it affects domestic market demand, as described by Merdikawati & Izzati (2025) regarding the impact of inflation and household consumption, while port infrastructure is a supporting factor for logistics and distribution, which can increase Central Sulawesi's competitiveness.

This result is reasonable form the entrepreneurs' point of view, because they prefer a competitive wage (Balafoutas et al., 2024). However, the economic growth and port capacities criteria are external conditions that an entrepreneur could handle (Leff, 1979). It is government's responsibility to improve those two criteria.

## 5. Conclusion

The results of the calculations show that the location of the Industrial Estate in Central Sulawesi Province is the top priority for development compared to other locations. This result could be a consideration to enhance industrial estate in Sulawesi island that drives economic activities, so that the underdeveloped regions could be improved to be as equal as possible compare to a more developed region in the west part of Indonesia. This means that giving more attention to establish industrial estate in east part of Indonesia would support the success of SISLOGNAS. However, these results do not necessarily rule out other alternative locations for the Industrial Estate. Alternative industrial zone locations can still be developed but are not a priority and require some improvements first. Based on the calculations, the final score for North Maluku Province shows a low score in the Port/Terminal Capacity criterion, so it is recommended that improvements in North Maluku to support the industrial zone should focus on increasing Port/Terminal Capacity. Meanwhile, for West Papua Province, which has the highest UMP (resulting in the lowest score for the UMP criterion), a trade-off can be considered to offset this low score. An example of a trade-off is the availability of skilled and competent labor in West Papua. The purpose of offering this trade-off is to ensure that an alternative location does not automatically fail and remains a viable option for an attractive Industrial Zone location.

This research also shed light that the benefit of using AHP method in prioritizing alternatives. In the same time, the conclusion also suggest that less-priority alternatives could be considered for improvement but with a less attention. This is because all alternatives could provide benefit for decision maker, although the benefit level for each alternative is slightly

different. A suggestion for future research is to use other criteria that also support the development of industrial estates in accordance with government policy, for example: the availability of natural resources, market size potential, and education level. In addition, it is necessary to consider the advantages and characteristics of each alternative location studied so that the various potentials of each alternative are apparent. Thus, it is hoped that each of these potentials can support decision-makers as a counterbalance to the final calculation value alone. Finally, experts or people with experience in the field should be involved in scoring each criterion.

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