Improving Integration of Transportation Modes for Hinterland of Prigi Commercial Port, East Java Province, Indonesia

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Prigi Commercial Port was developed to bridge the economic gap between northern and southern regions of East Java Province. Therefore this research analyses the integration of transportation modes in hinterland region of Prigi Commercial Port. Data was collected from the research region and assessed using Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI). The results have shown the transportation modes in hinterland region of Prigi Commercial Port to be inadequate and partially achieved. The government took two steps and the first was associated with the preservation and improvement of the positive aspects of transportation mode integration, such as intermodal network availability, route clarity, transfer points across various networks, and time. The second step addressed the less satisfactory elements, such as the availability of primary modes, information, clarity schedule transparency, fare details, clear timing information, and modes connection.

KEY WORDS

~ Integration of transportation modes
~ Hinterland of Prigi commercial port
~ Importance performance analysis
~ Customer satisfaction index analysis

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1. INTRODUCTION

East Java Province is equipped with a total of seventy ports, comprising one main port (MP), six collection ports (CP), fourteen regional feeder ports (RFP), and 49 local ports (LP) (Priyambodo, 2022), as shown in Table 1 . Currently, the government is constructing Prigi Commercial Port as shown in Figures 1 and 2. This port is strategically located in southern coastal region of East Java Province, precisely in a natural bay, in Watulimo District, Trenggalek Regency (Priyambodo et al., 2022). The main objective behind the construction process was to address the economic inequality between northern and southern regions of East Java Province (Yarushkina et al., 2022). This was observed in the varying Gross Regional Domestic Product (GRDP), attributed to unequal distribution and inadequate integration of transportation over a certain period (Ramadhan, 2023). In 2020, northern and southern regions of East Java Province recorded an average GRDP of IDR 175.1 trillion and 25.7 trillion, respectively (Priyambodo et al., 2022). Geographically, the economic gap between these regions is shown in Figures 3 and 4.

Pelabuhan di Jawa Timur					
1	Telaga Biru (Bangkalan)	26	P. Raas (Sumenep)	51	Bintaro (Sumenep)
2	Tanjung Wangi (Banyuwangi)	**27**	**Tanjung Perak (Surabaya)**	52	Dungkek (Sumenep)
3	Ketapang (Banyuwangi)	28	Kamal (Bangkalan)	53	Gayam (Sumenep)
4	Boom (Banyuwangi)	29	Nepa (Bangkalan)	54	Gili Genting (Sumenep)
5	Bawean (Gresik)	30	Poleng (Bangkalan)	55	Giliyang (Sumenep)
6	Gresik	31	Sepulu (Bangkalan)	56	Longos (Sumenep)
7	Brondong (Lamongan)	32	Ujung Piring (Bangkalan)	57	Masakambing (Sumenep)
8	Tanjung Pakis (Lamongan)	33	Blimbing Sari (Banyuwangi)	58	Nung Gunung (Sumenep)
9	Pacitan	34	Granjangan (Banyuwangi)	59	Pagar Batu (Sumenep)
10	Branta (Pamekasan)	35	Muncar (Banyuwangi)	60	Pagerungan (Sumenep)
11	Pasean (Pamekasan)	36	Pancer (Banyuwangi)	61	Pasongsongan (Sumenep)
12	Pasuruan	37	Camar (Gresik)	62	Pragaan (Sumenep)
13	Probolinggo	38	Tambak (Gresik)	63	Sepanjang (Sumenep)
14	Giliketapang (Probolinggo)	39	Jember	64	Tg. Saronggi (Sumenep)
15	Gilimandangin (Sampang)	40	Sendang Biru (Malang)	65	Sakala (Sumenep)
16	Sampang	41	Grati (Pasuruan)	66	Prigi (Trenggalek)
17	Taddan (Sampang)	42	Lekok (Pasuruan)	67	Jenu (Tuban)
18	Kalbut (Sitobondo)	43	Kalibuntu (Probolinggo)	68	Karang Agung (Tuban)
19	Panarukan (Situbondo)	44	Paiton (Probolinggo)	69	Tg. Awar-awar (Tuban)
20	Kalianget (Sumenep)	45	Tanlok (Sampang)	70	Tuban
21	Maslembu (Sumenep)	46	Besuki (Situbondo)		
22	Sapudi (Sumenep)	47	Jangkar (Situbondo)		
23	Sapeken (Sumenep)	48	Meimbo(Situbondo)		
24	Kangean (Sumenep)	49	Pasir Putih (Situbondo)		
25	Keramaian (Sumenep)	50	Ambunten (Sumenep)		

1 main port (MP)
14 regional feeder ports (RFP)
6 collection ports (CP),
49 local ports (LP)

Table 1. Ports in East Java (Source: East Java Province, Surabaya, 2021; Priyambodo, 2022)

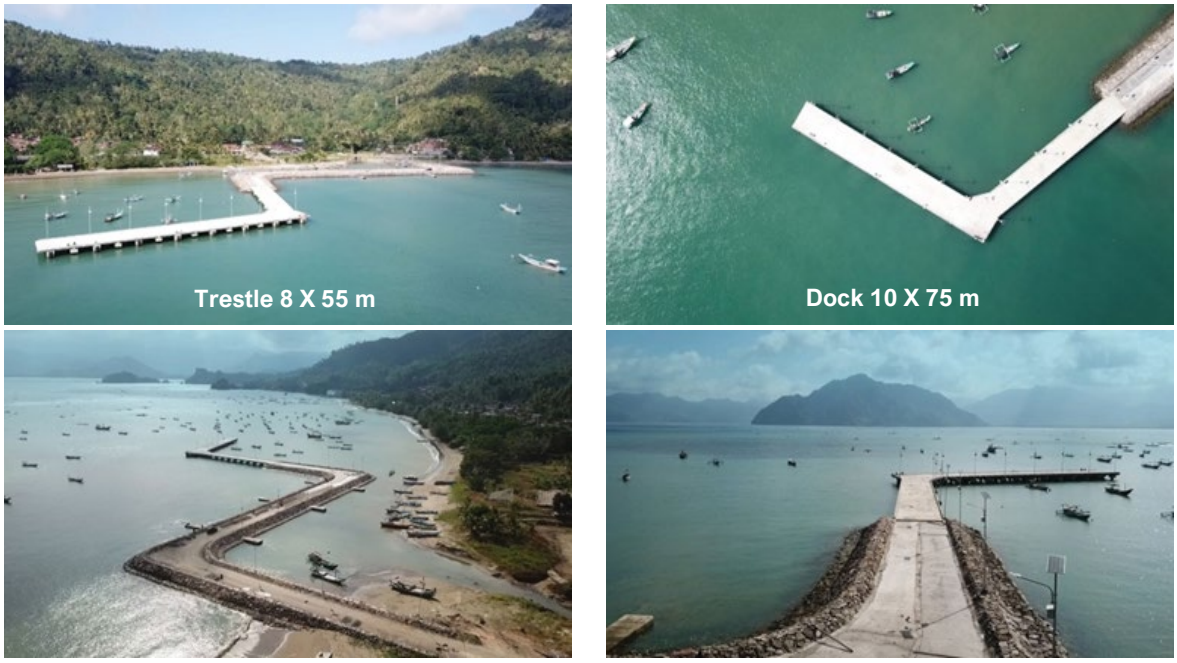

Figure 1. Construction of the Pier, Trestle, and Causeway of Prigi Commercial Port, Trenggalek Regency (Source: East Java in Figures, 2021; Priyambodo, 2022)

Figure 2. Prigi Commercial Port Development Plan, Trenggalek Regency (Source: East Java in Figures, 2021; Priyambodo, 2022)

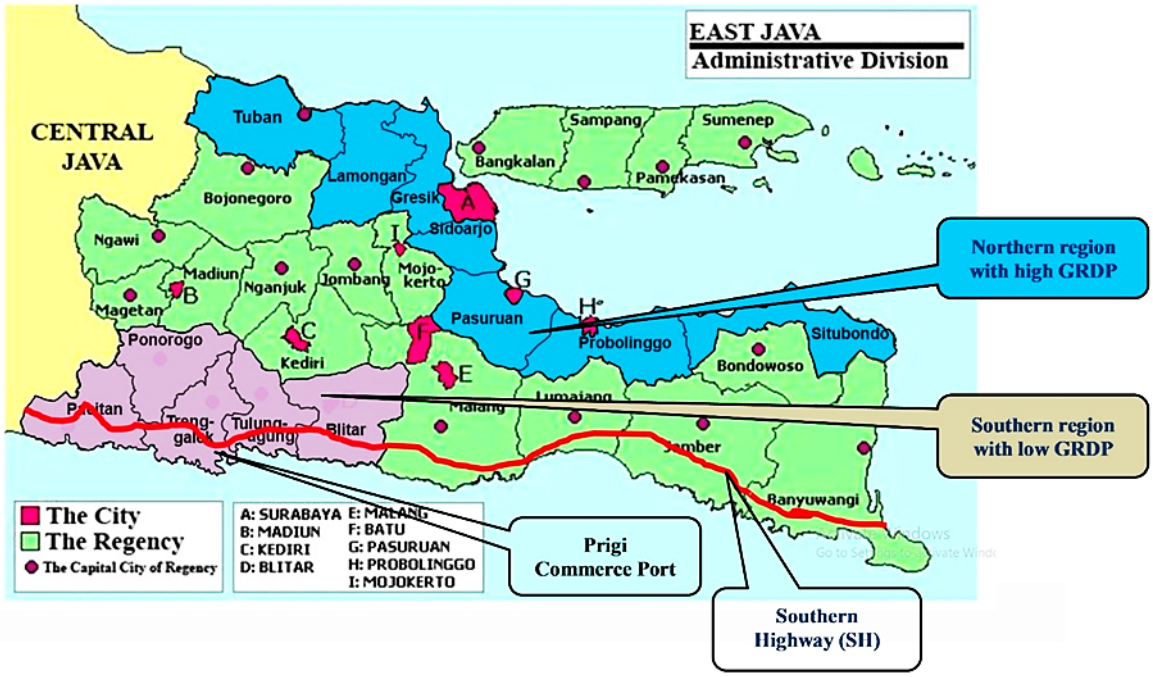

Figure 3. Development and Economic Gaps in Northern and Southern Regions of East Java Province (Source: East Java in Figures, 2021; Priyambodo, 2022)

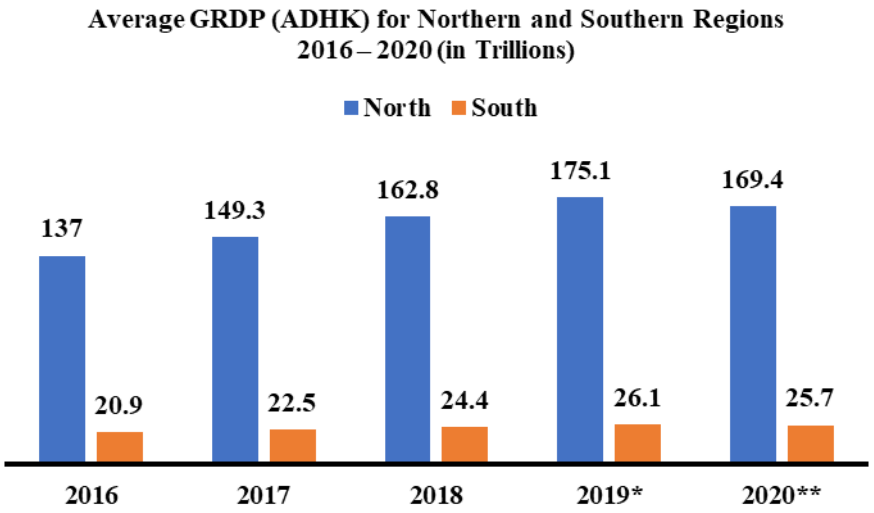

Figure 4. Average GRDP (ADHK) for Northern and Southern Regions of East Java Province 2016 – 2020 (Source: East Java in Figures, 2021; Priyambodo, 2022)

The disparity in GRDP was mainly influenced by the relatively advanced sea and land transportation facilities in northern coastal region (Priyambodo et al., 2022; Ramadhan, 2023). This region possessed a comprehensive network of 69 commercial ports, contributing to the higher GRDP. Meanwhile, southern region had only one, namely Prigi Commercial Port, currently under construction (Priyambodo, 2022).

The construction of Prigi Commercial Port is in line with the maritime highway policy implemented by the Central Government, connecting western and eastern regions of Indonesia through southern coast of Java

Island. The Sea Highway implementation programme focused on certain aspects, such as route, frequency, and volume of commodities transported by ships (Yudhistira, 2021).

In the field of shipping and port development, two basic concepts influence industry practices, namely The Ship Follows The Trade (Ships Promoting Trade), and The Trade Follows The Ship (Priyambodo, 2022). Generally, transportation infrastructure, specifically ports, was constructed based on The Ship Follows The Trade concept. This implied that rapid trade development preceded the establishment of transportation infrastructure. Conventional ports were built in response to the growing trade and economic activities. Therefore, the construction of Prigi Commercial Port introduced a unique perspective by accepting The Trade Follows The Ship concept. In this scenario, ports were strategically built to promote and facilitate trade, specifically in expanding isolated regions or hinterlands for economic development (Setijadi, 2021). The dynamism and growth of a port depended on the consistent and sustainable loading and unloading of goods, supported by hinterland, the surrounding region that acts as a buffer, thereby providing various commodities and products (Fan et al., 2019; Jung & ClaudeThill, 2022).

Located on southern coast of East Java Province, directly facing the Indian Ocean, Prigi Commercial Port strategically served as a gateway to hinterland or buffer region constituting Trenggalek Regency, Tulungagung Regency, Blitar Regency, Blitar City, Kediri Regency, Kediri City, Nganjuk Regency, Magetan Regency, Ponorogo Regency, Pacitan Regency, Madiun Regency, and Madiun City (Priyambodo, 2022). The effective integration of hinterland transport played a critical role in determining port competitiveness. Consequently, it is important to investigate the dynamic interactions among commodities, road networks, and intermodal transport leading to the ports (Saeed et al., 2022). This research is aimed at investigating the economic potential of southern region, as well as enhancing the integration of transportation modes, mainly to achieve balanced economic growth between northern and southern regions.

2. METHOD

2.1. Theoretical Framework

The theoretical framework depends on Resource-Based View (RBV) theory, describing the competitive advantage of a company with respect to the effective use of resources for sustainability (Chatterjee, 2023). The main concept of RBV theory is to understand how this attribute was maintained over time. Therefore, in the face of global competition, Prigi Commercial Port, situated in southern part of East Java Province, must cultivate a competitive advantage. This attribute relies on the support of an integrated transportation system (Priyambodo, 2022; Priyambodo et al., 2022).

Intermodal transportation network integration aims at optimizing services by combining multiple modes of transportation. However, this objective had not been realised in southern region of East Java Province (Priyambodo, 2022; Priyambodo et al., 2022).

Effective transportation integration includes assessing two essential parameters, namely travel time and costs (Kłos &´ nski, 2021). Meanwhile, the multimodal concept, synonymous with integration, comprised six main factors (Archetti, 2022; Charoennaphara & Chaopaisarn, 2022), including connecting and main modes, multimodal networks, transfer points, modal switching facilities or transfer points with different networks, and supporting regulations.

In general, integration entails combining different modes to form a unified system. Furthermore, a mode represents a distinct form or type of transportation applicable to passengers and goods. The success of transportation service system in a region or city was often attributed to the integration of related modes. In this

research, transportation mode integration is the comprehensive blending of various transportation forms to facilitate the movement of people and goods from one place to another (Rahman, 2021).

Anastasia Gurzhiy et al. (2021) defined transportation integration as the comprehensive consistency of policies across various modes. This includes the integration of policies related to the development of facilities and infrastructure, management, information, and ticketing systems. In addition, it requires the harmonisation of transportation with land use and other modes.

Performance assessment of intermodal or integrated transportation from hinterland ports adhered to the guidelines mandated in the Decree of the Minister of Transportation of Indonesia Number 49 of 2005 concerning the National Transportation System (NTS). The decree comprised fourteen crucial indicator variables for transportation services, covering accessibility, integration, capacity, tariffs, safety, security, order, comfort, smoothness and speed, regularity, punctuality, pollution, and efficiency (Humang, 2018).

Efficient operational activities at a port relied on the identification of critical components in transportation system, including prioritising the planning and management of an integrated transportation mode network (Lin & Lin, 2022). Therefore, identifying the importance of transportation modes, specifically road and intermodal, is essential for ensuring the smooth conveyance of goods between hinterland regions and ports (Davidich et al., 2021).

The dynamism and growth of a port depended on the consistent and sustainable loading and unloading of goods, including the support of an inland region functioning as a buffer, supplying a variety of commodities and products (Fan et al., 2019; Jung & ClaudeThill, 2022).

Prigi Commercial Port, directly facing the Indian Ocean, is surrounded by the following hinterland regions: Trenggalek, Tulungagung, Blitar, Kediri, Nganjuk, Magetan, Ponorogo, Pacitan, and Madiun Regencies (Priyambodo, 2022). Identifying the importance of adequately integrated hinterland transportation is critical to investigate the interplay among commodities, road networks, and intermodal transportation to ports (Saeed et al., 2022).

The indicators and concepts related to intermodal transportation include the assessment of various factors, such as travel time duration, affordability of fares, presence and availability of connecting, and main modes, existence of an intermodal network, presence of transfer points with different networks, routes, accessibility of schedule, and timely information (Priyambodo, 2022). This was realised by using an analytical method to calculate the Importance of Performance Analysis (IPA) and Customer Satisfaction Index (CSI). IPA calculations were dependent upon qualitative data, quantified using a Likert scale ranging from 1 to 5 (Azzochrah, 2022; Sihotang, 2022). The primary data sources include the perspectives of port and road transport users, expedition companies, government entities, road transport, and port associations in the inland region surrounding Prigi Commercial Port.

This present research uniquely contributes to both academic understanding and practical applications by introducing the innovative concept of port development based on The Trade Follows The Ship. In addition, the novelty of the investigation aims at promoting economic growth in the remote and underdeveloped southern region of East Java Province (Setijadi, 2021). The theoretical framework in Figure 5 shows the need to enhance transportation integration in the research region to support the operationalisation of Prigi Commercial Port. The integration aspect comprises ten variables, namely intermodal transportation and networks, connecting and main modes, switching points, indicators of switching points with different networks, routes, tariffs, schedules, and time. The variables have been calculated based on the perceptions of experts, including port and road transport users, government officials, and business associations. Furthermore, the expert perceptions have been qualitatively evaluated using the Importance-Performance and Customer Satisfaction Index Analyses (CSI). This is aimed at determining the quality of transportation integration in the inland region of Prigi

Commercial Port. The assessment guided improvement where integration may be lacking, ensurong the maintenance of satisfactory aspects.

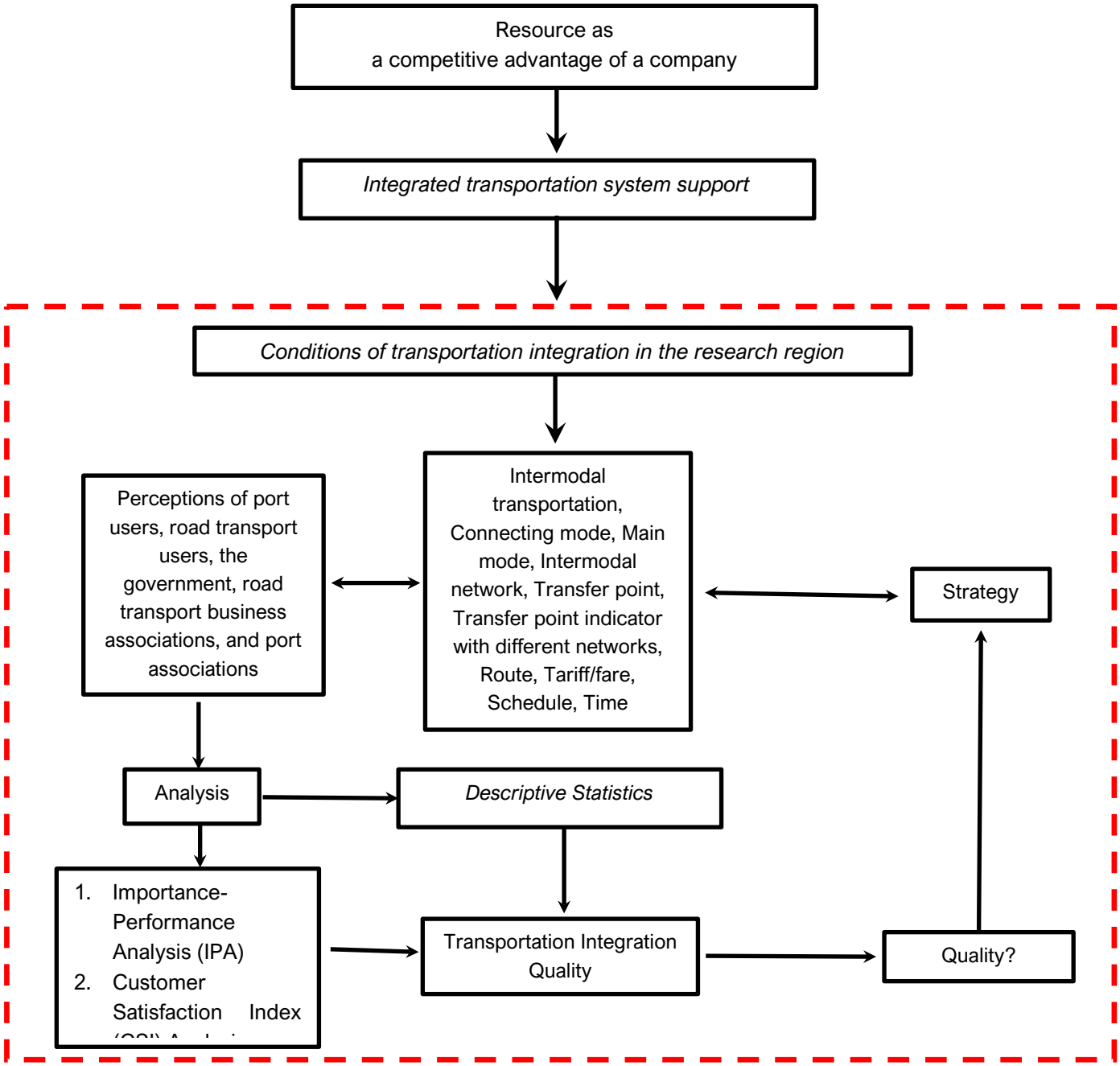

Figure 5. Theoretical framework

2.2. Data

This research focuses on hinterland of Prigi Commercial Port, comprising Trenggalek, Tulungagung, Blitar, Pacitan, and Ponorogo Regencies. The primary data collection activities has included gathering perceptions from respondents regarding personal expectations and the performance of ten integration indicators, as shown in Table 3. These indicators are crucial for assessing transportation links to and from Prigi Commercial Port. This research was conducted between March and November 2022, with 165 respondents from southern region of Prigi Commercial Port. Furthermore, the sample size of 165 respondents, greater than

30 and less than 500, met the stipulated criteria (Sekaran, 2006). A probability sampling method was adopted, offering equal opportunity for every selection process, considering the extensive coverage of five districts. It includes the use of cluster sampling with an even distribution of 33 respondents in each district. To determine whether there is a statistically significant difference between multiple groups of independent variables in numerical data (range/proportion) and ordinal scale in the dependent variable, Kruskel-Wallis Test has been carried out, as shown in Table 2.

Nb	Indicators	Regency/City				
		Trenggalek Regency	Tulungagung Regency	Blitar Regency/City	Ponorogo Regency	Pacitan Regency
1	Intermodal transportation	-1,06	0,21	0,39	-0,67	-0,48
2	Connecting mode	-0,48	0,42	0,36	-0,64	0,3
3	Main mode	0,18	0,33	0,55	0,24	0,21
4	Intermodal network	-0,33	0,52	0,58	-0,76	-0,88
5	Transfer point	-0,55	-0,03	-0,15	-0,58	-0,7
6	Transfer point indicator with different networks	-0,7	0,12	0,36	-0,67	-0,85
7	Route	0,24	0,48	0,03	-0,7	-0,06
8	Tariff/fare	0,18	0,27	0,27	-0,67	0,15
9	Schedule	-0,03	0,21	0,27	-0,67	-0,42
10	Time	0,06	0,18	-0,06	-0,79	0,09
P value		0,000*	0,774	0,002*	0,002*	0,000*
		Significant	Not-Significant	Significant	Significant	Significant

Table 2. Kruskal-Wallis Test (Source : Primary data was processed using SPSS, 2022)

The results of Kruskall Wallis test showe that there was a significant difference in the assessment of parameters obtained from Trenggalek, Blitar Regency/City, Ponorogo, and Pacitan Regencies, with a sig value of <0.05. Meanwhile, in Tulungagung Regency, no significant differences have been observed in the assessment of the parameters.

In Trenggalek Regency, the greatest difference in assessments has been found in intermodal transportation indicators, with an average of -1.06. Meanwhile, in Blitar Regency/City, the largest difference has been found in intermodal network indicators, with an average of 0.58. In Ponorogo and Pacitan Regencies, the largest difference has been found in the time and intermodal network indicators, with an average of -0.79, and -0.88, respectively.

Respondents consisted of port and road transport users, freight forwarders, government representatives, as well as members of road transport, and port associations. The individuals are knowledgeable about trade, regional economy, ports, transportation, and East Java region, specifically the hinterland region of Prigi Commercial Port.

The average respondent is aged between 35 and 60 years old, with a bachelor degree, a high school diploma and has worked as port user or government official. However, in Tulungagung Regency, these individuals have often engaged in road transport activities and businesses, while the individuals in Blitar Regency/City have worked as road transport and port users and associates. In Pacitan Regency, they were usually employed in the government, or worked as road transport business and port associations. Finally, in Ponorogo Regency, the respondents have worked as port users, or held positions in the government.

Additional primary data has included the assessment of existing ports, road facilities, and infrastructure through field recording and observation. Tables 4 to 8 show the tabulation of this data, categorised based on

importance and performance. Furthermore, demographic details, including age, gender, education, and occupation, are seen in Figures 6, 7, and 8.

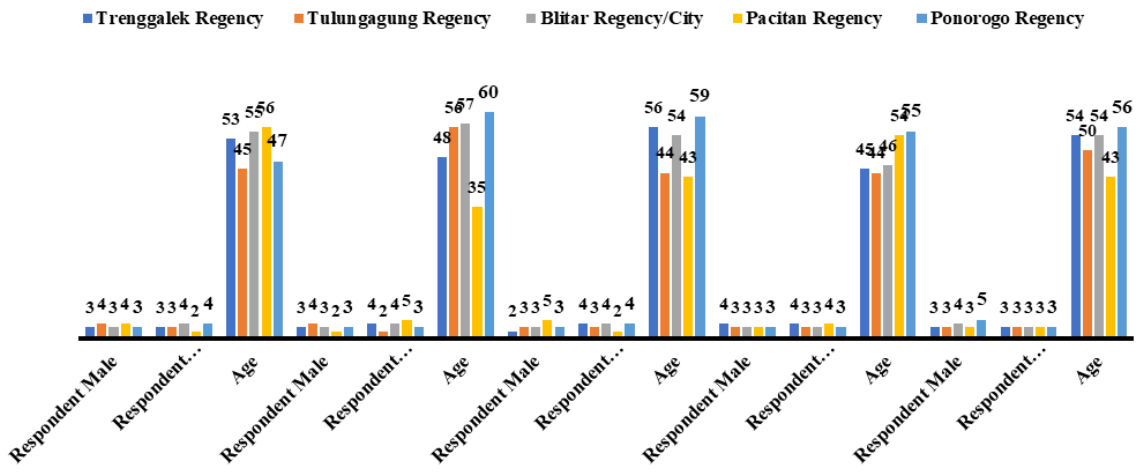

Figure 6. The Age and Gender of Respondents

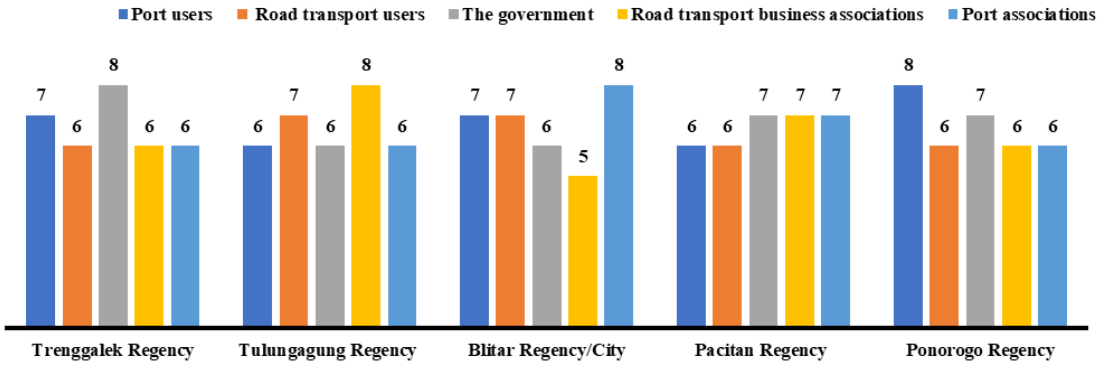

Figure 7. The Occupation of Respondent

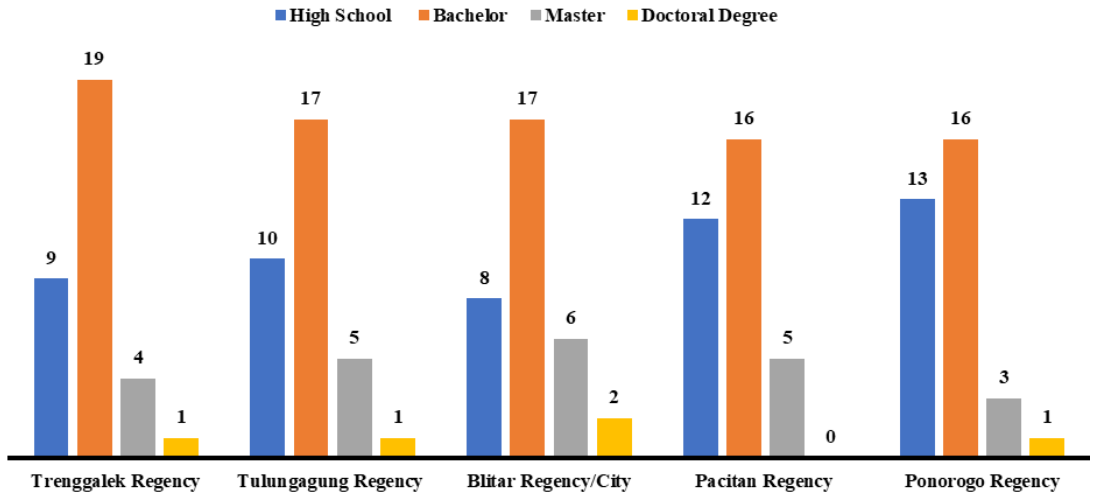

Figure 8. The Education of Respondent

YOUR EXPECTATIONS					Nb.	STATEMENTS/QUESTION ABOUT	WHAT YOU FEEL				
5	4	3	2	1			5	4	3	2	1
					a	Intermodal transportation					
					b	Connecting mode					
					c	Main mode					
					d	Intermodal network					
					e	Transfer point					
					f	Transfer point indicator with different networks					
					g	Route					
					h	Tariff/fare					
					I	Schedule					
					j	Time					

Definition:

5 = Very important/Very satisfied; 4 = Important/Satisfied; 3 = Quite important/Quite satisfied;

2 = Not important/Not satisfied; 1 = Very unimportant/Very dissatisfied

Table 3. Integration: Put a tick mark (√) in the appropriate column

Trenggalek Regency

Indicators	Respondents	Var code	Average value			
			Importance (Y)		Performance (X)	
			Var value	Weight (%)	Var value	Weighted
Intermodal transportation	33	V01	4.27	18.18	3.21	0.58
Connecting mode	33	V02	3.76	16.01	3.27	0.52
Main mode	33	V03	4.09	17.41	4.27	0.74
Intermodal network	33	V04	4.18	17.79	3.85	0.69
Transfer point	33	V05	3.94	16.77	3.39	0.57
Transfer point indicator with different networks	33	V06	3.88	16.52	3.18	0.53
Route	33	V07	3.88	16.52	4.12	0.68
Tariff/fare	33	V08	3.82	16.26	4	0.65
Schedule	33	V09	3.97	16.9	3.94	0.67
Time	33	V10	4	17.03	3.94	0.67
Average			**3.92**		**3.76**	
Amount			**23.49**	**100**		**3.76**
					CSI	**75.23**

Table 4. Tabulation of Primary Data on Importance – Performance of Transportation Integration in Trenggalek Regency

Tulungagung Regency

Indicators	Respondents	Var code	Average value			
			Importance (Y)		Performance (X)	
			Var value	Weight (%)	Var value	Weighted
Intermodal transportation	33	V01	4	16.75	4.21	0.71
Connecting mode	33	V02	4.15	17.38	4.58	0.8
Main mode	33	V03	3.85	16.12	4.18	0.67
Intermodal network	33	V04	4.06	17	4.58	0.78
Transfer point	33	V05	3.79	15.87	3.76	0.6
Transfer point indicator with different networks	33	V06	4.12	17.25	4.45	0.77
Route	33	V07	4.09	17.13	4.58	0.78
Tariff/fare	33	V08	3.85	16.12	4.12	0.66
Schedule	33	V09	3.91	16.37	4.12	0.67
Time	33	V10	4.12	17.25	4.3	0.74
Average			**3.98**		**4.22**	
Amount			**23.88**	**100**		**4.23**
					CSI	**84.59**

Table 5. Tabulation of Primary Data on Importance – Performance of Transportation Integration in Tulungagung Regency

Blitar Regency

Indicators	Respondents	Var code	Average value			
			Importance (Y)		Performance (X)	
			Var value	Weight (%)	Var value	Weighted
Intermodal transportation	33	V01	3.91	15.93	4.3	0.69
Connecting mode	33	V02	4.03	16.42	4.39	0.72
Main mode	33	V03	3.88	15.81	4.42	0.7
Intermodal network	33	V04	4.15	16.91	4.73	0.8
Transfer point	33	V05	4.39	17.89	4.24	0.76
Transfer point indicator with different networks	33	V06	4.15	16.91	4.52	0.76
Route	33	V07	4.06	16.54	4.09	0.68
Tariff/fare	33	V08	4	16.3	4.27	0.7
Schedule	33	V09	3.73	15.2	4	0.61
Time	33	V10	4.21	17.16	4.15	0.71
Average			**4.09**		**4.21**	
Amount			**24.54**	**100**		**4.22**
					CSI	**84.31**

Table 6. Tabulation of Primary Data on Importance – Performance of Transportation Integration in Blitar Regency

Ponorogo Regency

Indicators	Respondents	Var code	Average value			
			Importance (Y)		Performance (X)	
			Var value	Weight (%)	Var value	Weighted
Intermodal transportation	33	V01	3.91	16.52	3.24	0.54
Connecting mode	33	V02	3.97	16.77	3.33	0.56
Main mode	33	V03	3.73	15.76	3.97	0.63
Intermodal network	33	V04	4.15	17.53	3.39	0.59
Transfer point	33	V05	4.15	17.53	3.58	0.63
Transfer point indicator with different networks	33	V06	3.7	15.63	3.03	0.47
Route	33	V07	4.15	17.53	3.45	0.6
Tariff/fare	33	V08	4	16.9	3.33	0.56
Schedule	33	V09	3.58	15.12	2.91	0.44
Time	33	V10	4.09	17.28	3.3	0.57
Average			**3.95**		**3.27**	
Amount			**23.67**	**100**		**3.28**
					CSI	**65.59**

Table 7. Tabulation of Primary Data on Importance – Performance of Transportation Integration in Ponorogo Regency

Pacitan Regency

Indicators	Respondents	Var code	Average value			
			Importance (Y)		Performance (X)	
			Var value	Weight (%)	Var value	Weighted
Intermodal transportation	33	V01	4.24	17.78	3.76	0.67
Connecting mode	33	V02	4.03	16.9	4.33	0.73
Main mode	33	V03	4.15	17.4	4.36	0.76
Intermodal network	33	V04	4.21	17.65	3.33	0.59
Transfer point	33	V05	3.91	16.39	3.21	0.53
Transfer point indicator with different networks	33	V06	3.94	16.52	3.09	0.51
Route	33	V07	4.09	17.15	4.03	0.69
Tariff/fare	33	V08	4	16.77	4.15	0.7
Schedule	33	V09	4	16.77	3.58	0.6
Time	33	V10	3.91	16.39	4	0.66
Average			**3.98**		**3.68**	
Amount			**23.85**	**100**		**3.68**
					CSI	**73.6**

Table 8. Tabulation of Primary Data on Importance – Performance of Transportation Integration in Pacitan Regency

After analysing the data obtained from each of 33 respondents, the significance value (sig 2-tailed) for the relationship between indicators (Xn) and (Y) was 0.000 < 0.05. This suggests the existence of a significant relationship between both indicators. In addition to the distribution of questionnaires, interviews and observations have also been conducted for a comprehensive assessment.

The secondary data consists of information on Prigi Commercial Port, intermodal transportation, network, and regional potential. This data was collected from Prigi Commercial Port region authorities, goods transport entrepreneurs, managers of transportation infrastructure, as well as Transportation Services of East Java Province, Trenggalek, and Tulungagung Regencies.

2.3. Analysis

The analysis focuses on evaluating the results regarding the conditions and role of integrating transportation modes to facilitate the operationalisation of Prigi Commercial Port. In addition, the assessment has been performed using IPA and CSI calculations.

IPA for intermodal integration requires the use of ten indicators, namely intermodal transportation, connection and main modes, multimodal networks, transfer points, and the diverse networks, routes, tariffs, schedules, and timing. Additionally, CSI measures customer satisfaction by comparing expectations and with the actual performance of the assessed factors.

This research uses IPA and CSI methods to explore the development and implementation of CSI. According to Zenker et al. (2009), important ranking concepts were used to reduce the initial set to 21 distinct items. These items comprised various cultural activities, such as nightlife, shopping opportunities, diverse cultures and subcultures, city energy, atmosphere and image, service availability, openness and tolerance, nature and public green regions, environmental quality (low pollution), number of parks and open spaces, outdoor activities, cleanliness, access to water, overall wages, job opportunities and promotion, general economic growth in a particular region, professional network, housing market or recruitment costs, general price level in the city or cost of living, as well as availability of apartments and houses. These items have been resized by different factor structures and condensed into four highly correlated factors with alphas > 0.74. The four factors are Urbanity and diversity, Nature and recreation, Job Opportunities, and Cost Efficiency (Poliaková, 2015; Zenker et al., 2009).

IPA in Figure 9 shows that all indicators influence service quality and have been mapped into four quadrants. The division of quadrants in this analysis is described as follows:

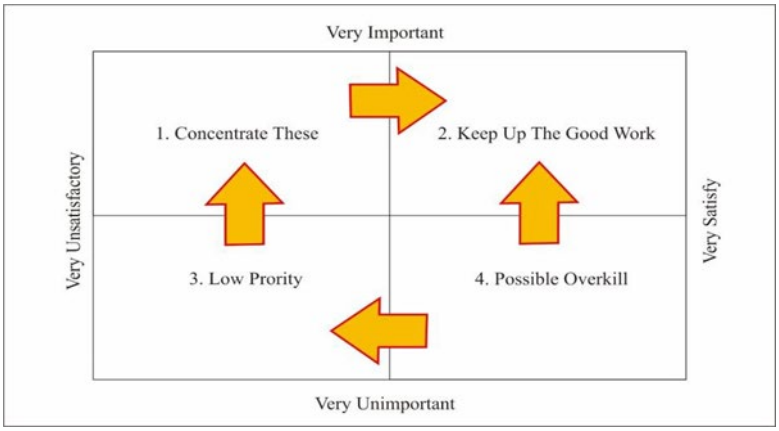

Figure 9. Map of Importance – Performance (Source: (Nugraha et al., 2013; Ormanović et al., 2017)

The strategies corresponding to the position of each indicator on the four quadrants shown in Figure 9, have been described as follows (Nugraha et al., 2013; Ormanović et al., 2017):

- Quadrant 1 (contains factors that respondents consider necessary)
- In reality, the factors in Quadrant 1 falls short of meeting the expectations of respondents, leading to lower satisfaction levels. The indicators in this quadrant must be improved to transition into Quadrant 2.
- Quadrant 2 (Keep Up The Good Work)
- The factors in Quadrant 2 were considered important by customers, leading to relatively higher satisfaction levels. The indicators must be maintained, because they collectively contribute to the superior quality of the product or service.
- Quadrant 3 (Low Priority)
- Quadrant 3 contains factors considered less important by respondents, with insignificantly impressive performance in reality. Reconsidering the enhancement of indicators in this quadrant may be necessary, given the minimal impact on the perceived benefits.
- Quadrant 4 (Possible Overkill)
- The factors in Quadrant 4 are considered less important by respondents and should be streamlined to save costs.
- The procedure for measuring CSI includes the following steps (Amri et al., 2020):
- Weighting Factors, calculated by dividing the average importance score for each factor by the total importance score as a whole. The aim is to convert the importance score into a percentage, ensuring that a total weighting factor of 100% is obtained.
- The value of weighting factors has been multiplied by respective satisfaction scores to obtain Weighted Score.
- Weighted Score of each factor is added to obtain a Weighted Average.
- Weighted Average is divided by the maximum scale value used in the research, with the resultant quotient multiplied by 100% to obtain the Satisfaction Index.

The interpretation of CSI results is shown in Table 9.

Index Numbers	Interpretation
60%	Very Poor
65%	Poor
70%	Cause For Concern
75%	Border Line
80%	Good
85%	Very Good
90%	Excellent

Table 9. Interpretation of CSI Calculation Results (Source: (Hill et al., 2001)

3. RESULTS AND DISCUSSION

3.1. Prigi Commercial Port and Hinterland

The construction of Prigi Commercial Port was realized through collaboration between Trenggalek Regency Government and East Java Province. In this coordinated effort, Trenggalek Regency Government was responsible for land acquisition, while the physical development was overseen by East Java (Priyambodo, 2022).

Prigi Commercial Port is situated approximately 48 km to south of Trenggalek Regency (Priyambodo, 2022). Prigi region, recognised for its considerable potential in fisheries and tourism, serves as hinterland for the port. It comprises Trenggalek Regency, Tulungagung Regency, Kediri Regency/City, Blitar Regency/City,

Nganjuk Regency, Magetan Regency, Madiun Regency/City, Pacitan Regency, and Ponorogo Regency (Islami, 2021), as shown in Figure 10. In addition, the appearance of the pier is visually represented in Figure 11.

Prigi Bay, located in Watulimo District, consists of three villages, namely Prigi, Tasikmadu, and Karanggandu. Meanwhile, Watulimo District constitutes a total of twelve villages, including Karanggandu, Prigi, Tasikmadu, Watulimo, Margomulyo, Sawahan, Dukuh, Slawe, Gemaharjo, Pakel, Ngembel, and Watuagung.

The Prigi Commercial Port was advanced through the establishment of a robust hinterland where products or commodities can be efficiently handled. The sustainability of the port depends on the accessibility of goods in the vicinity, relying on the significance of cost-effective transportation methods over land transport in the contemporary concept of hinterlands (Jung & ClaudeThill, 2022).

Hinterland of Prigi Commercial Port plays a significant role in facilitating most of the trade, potentially reducing the dependence on public transportation (Sdoukopoulos & Boile, 2020). This reliance is influenced by various complex factors, such as time, politics, and the nature of the commodities (Sdoukopoulos & Boile, 2020). However, Santos et al. (2021) proposed the application of a probability-based model reliant on port market share for hinterland regions to address the complexities associated with these factors.

Prigi Commercial Port was constructed based on an innovative method considering trade potential, road network availability, topographic and geographical conditions, including prospective commodities. This method was in accordance with The Trade Follows The Ship concept, which had not been implemented in Indonesia. Setijadi (2021) advocated for development in remote and underdeveloped regions, particularly in southern region of East Java Province. Furthermore, an important aspect of this concept entailed establishing a cohesive transportation network that effortlessly integrated both land and sea modes (Saeed et al., 2022).

Port development typically adhered to two main concepts, namely The Ship Follows The Trade and The Trade Follows The Ship (Adisasmita, 2011; Priyambodo, 2022). In general, ports were established based on The Ship Follows The Trade concept, where the rapid growth of trade drives development. In this scenario, ports mainly served as facilitators of the existing trade and economic activities. However, the construction of Prigi Commercial Port adhered to the distinctive concept of The Trade Follows The Ships, promoting trade. Unlike the conventional model, this port was built ahead of extensive trade development, with the aim of advancing and developing isolated regions or hinterlands to promote subsequent economic growth (Setijadi, 2021). The future success of Prigi Commercial Port remained uncertain, particularly considering the limited industrial, economic, and trade activities in the hinterland.

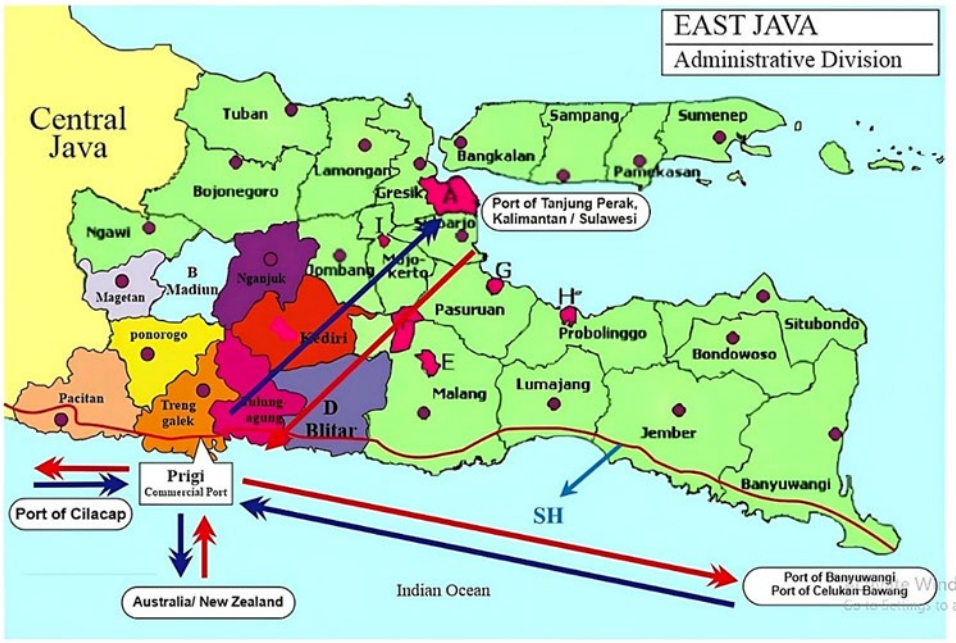

Figure 10. Hinterland of Prigi Commercial Port in Watulimo District, Trenggalek Regency (Source: modified from Google – search)

Figure 11. Prigi Commercial Port Pier in Watulimo District, Trenggalek Regency

3.2. Trade Potential

Another important aspect of Prigi Commercial Port is the trade potential, aside from the hinterland. The potential is closely intertwined with the export-import activities of East Java Province (Trenggalek Regency Government, 2022). Figure 12 shows that the export-import potential of East Java Province, comprises ten leading commodities, including machinery, iron and steel, plastics, electrical equipment, fertiliser, food waste, grains, organic chemicals, and oily grains. Furthermore, the exported goods include jewelry or gems, organic chemicals, wood products, animal fats and oils, fish and shrimp, paper or cardboard, electrical machinery or equipment, various chemical products, processed meat and fish, as well as copper.

Examining the export-import commodity data in southern region presents an opportunity for Prigi Commercial Port to play a significant role. This includes the handling and unloading of various commodities, such as fishery products and handicrafts. According to data from Central Bureau of Statistics (CBS), East Java

Province has experienced an economic gap of 15% between southern and northern regions in 2012. Southern region, influenced by geographical accessibility and infrastructure challenges, predominantly relies on the agricultural sector for development, with limited industrial presence. As a result, logistics costs tend to be higher compared to northern region (Christino-Boyke, 2017; Islami, 2021).

The leading commodities, determined by production volume and receipts, comprise Deles Flyfish, Lemuru, Yellowfin, and Como Tuna. From 2011 to 2015, these superior capture fisheries commodities contributed an average of 0.9%, 0.9%, 0.3%, and 0.1%, respectively to Regional Revenue (RP) (Sari, 2018). Prigi Commercial Port holds significant potential to increase the economy in southern region of East Java, serving as a catalyst for growth, specifically in southern part of Trenggalek Regency and the surroundings. The establishment of new economic avenues is considered a strategic method for alleviating the 40% and 30% of poverty rates in Java and southern part of Indonesia.

East Java Provincial Government can use the port for trade missions, enhancing the functionality. Furthermore, it was anticipated to be connected to several facilities, including Southern Highway (SH). Prigi Commercial Port would have access to diverse regions in East Java, even Yogjakarta after it had been connected to SH. SH, currently associated with west, is expected to be connected to Tulungagung next year, potentially joining regions from Blitar to Malang. The airport intended to be built in Kediri will also add to the connectivity network. The advantageous feature of the relatively calm waters further enhance the appeal of Prigi Commercial Port.

The commercial port is strategically positioned to restructure the distribution network for premium goods from Trenggalek and the surrounding regions to various parts of Indonesia through maritime routes**. It is expected to contribute to economic growth in southern region of Java, specifically in conjunction with the development of** SH**, Dhoho Kediri Airport, and** the maritime potential in south of Trenggalek. Serving as a gateway for export and import activities with Australia, New Zealand, Prigi and Commercial Port, with an expansive 500 hectare bay, has the potential to appear as a dynamic economic force or powerhouse in southern region (Tim FreightSight, 2022).

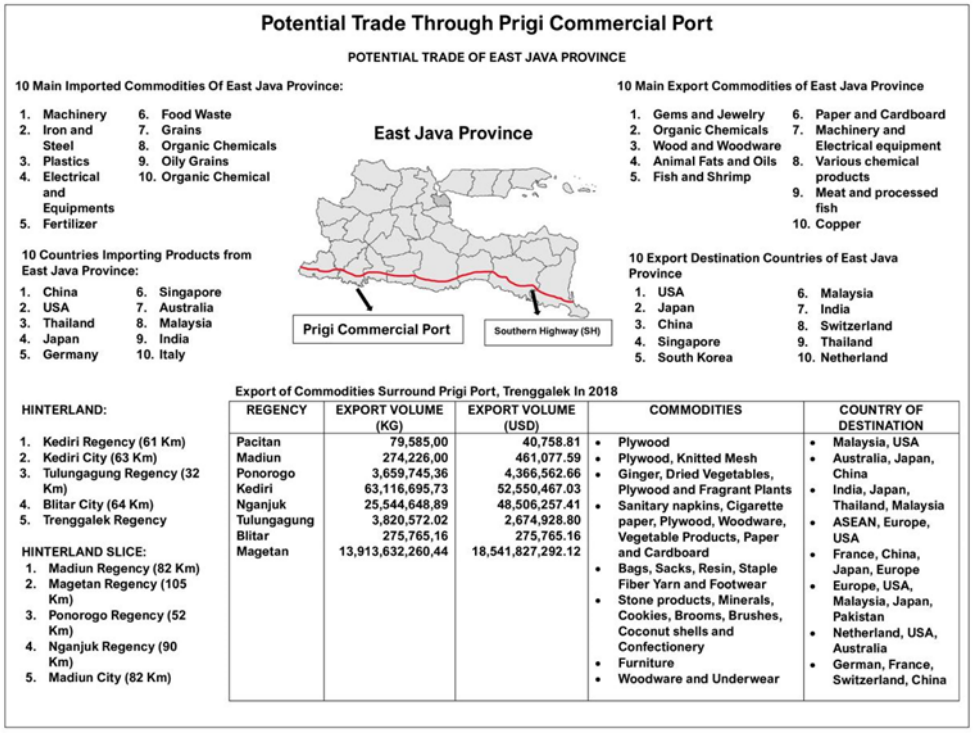

Figure 12. Trade Potential through Prigi Commercial Port *(Source: Trenggalek Regency Government, 2022)*

3.3. Integration of Transportation Modes

The integration of transportation modes in Prigi Commercial Port has been assessed using IPA analysis, taking into account the preferences of key stakeholders. These comprise port and road transport users, government entities, and transport business associations in the five hinterland regions, namely Trenggalek Regency, Blitar Regency/City, Tulungagung Regency/City, Pacitan Regency, and Ponorogo Regency. The evaluation process includes the use of ten indicators, namely Intermodal transportation V01, Connecting mode V02, Main mode V03, Intermodal network V04, Transfer point V05, Transfer point with different networks V06, Route V07, Fare V08, Schedule V09, and Time V10.

Trenggalek Regency

The assessment of transportation mode integration in Trenggalek Regency, as shown in Figure 13, has been analyzed as follows: three indicators, namely main modes, availability of intermodal networks, and clarity of information when transporting goods (time), have positive values and fall in Quadrant 2. This means that the tree indicators are considered important by respondents due to the satisfactory performance. The performance and importance values of the three indicators exceed the average, depicting a high significance. As a result, the focus should be on maintaining the performance of these indicators. Three other indicators, situated in Quadrant 1, namely route, tariff or fare, and schedule, require considerable attention. The indicators were considered important by respondents, despite the poor or below average performance. Concerted efforts are needed to enhance performance, aiming at categorising the indicators into Quadrant 2. Out of the ten indicators, seven are positioned outside Quadrant 2, depicting that the overall land transportation system in Trenggalek Regency lacks effective integration. Therefore, Quadrant 2 is shown to be the best compared to the others, because both Performance (X) and Importance (Y) values are positive.

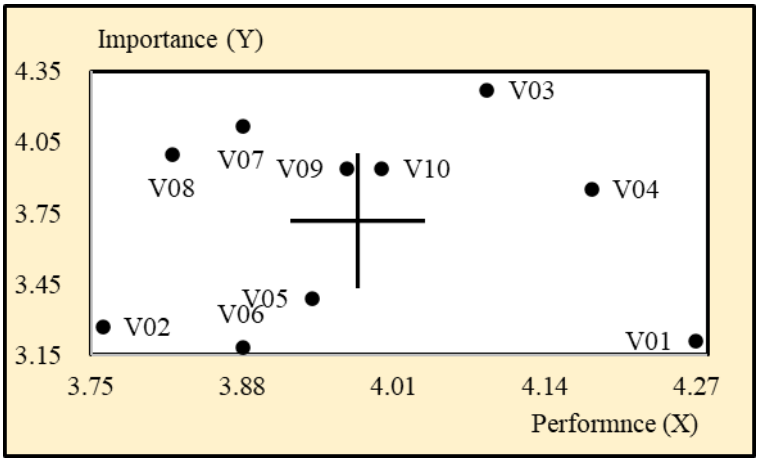

Figure 13. IPA for transportation integration in Trenggalek Regency

Tulungagung Regency/City

Evaluating the state of transportation mode integration in Tulungagung Regency, as shown in Figure 14, provides the following insights, among the ten indicators, five have positive values, namely intermodal network, point movement with different networks, route, connecting mode, and time. These indicators, categorised in Quadrant 2, have positive signs, meaning that it was considered important and highly effective by respondents. Both the Importance and performance values exceed the average, depicting the significance and effectiveness of the indicators. Therefore the focus should be on maintaining the performance of these indicators. With five indicators in Quadrant 2, the integration of transportation modes in Tulungagung Regency/City was considered superior compared to other regions.

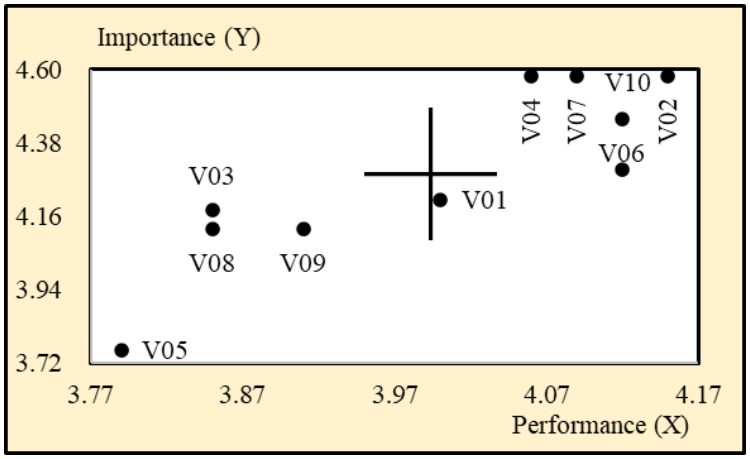

Figure 14. IPA for transportation integration in Tulungagung Regency

Blitar Regency/City

The evaluation of transportation integration in Blitar Regency/City, as shown in Figure 15, has illustrated that out of the ten indicators considered, only two have positive values. Specifically, the intermodal network and point shift indicators have been categorised under Quadrant 2, meaning that the importance and performance values exceed the average. These indicators are considered crucial, leading to the maintenance of the current performance levels. The connecting and main mode indicators in Quadrant 1 require serious attention. Despite being considered important, the performance of these indicators was less than average. Concerted efforts should be directed towards improving performance in order to be positioned in Quadrant 2. The overall assessment show that in Blitar Regency/City only two transportation indicators are categorized in Quadrant 2, while the remaining eight have been placed in the others. This suggests that the broader land transportation system in Blitar has not achieved an optimal level of integration and required enhancements, particularly in addressing the performance of indicators in Quadrant 1.

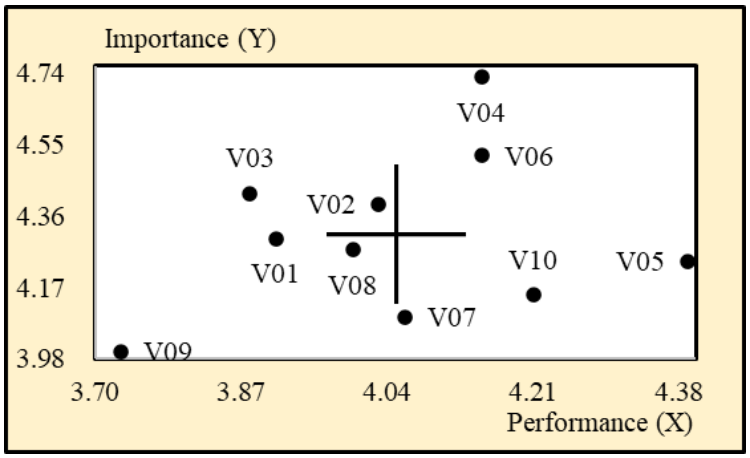

Figure 15. IPA for transportation integration in Blitar Regency/City

Ponorogo Regency

The assessment of transportation integration in Ponorogo Regency, presented in Figure 16, shows that tree indicators out of a total of ten have positive values and are categorised in Quadrant 2. These indicators, namely intermodal network, transfer point, and route have importance and performance values exceeding the

average. Therefore the performance of these indicators needs to be maintained. The primary mode indicator, situated in Quadrant 1, requires serious attention, as the performance is below the average, despite being acknowledged by the respondents. Concerted efforts should be made to enhance the performance, with the aim of transitioning it into Quadrant 2. From the ten transportation integration indicators in Ponorogo Regency, only three are situated in Quadrant 2. This suggests a lack of comprehensive integ\ration in the land transportation system of the region.

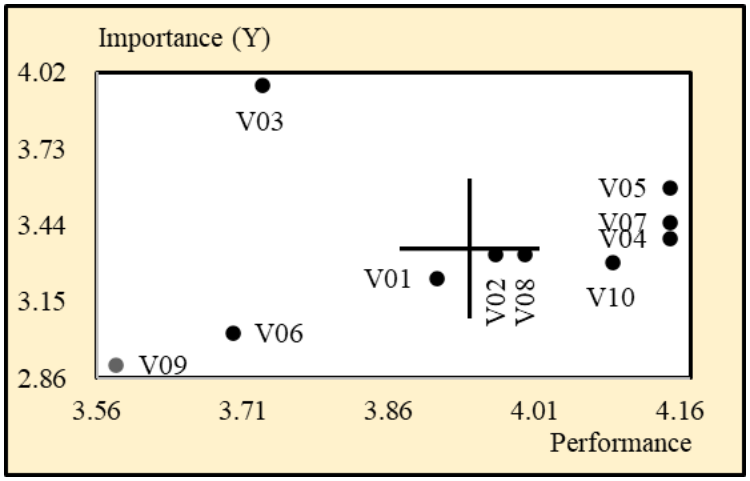

Figure 16. IPA for transportation integration in Ponorogo Regency

Pacitan Regency

Figure 17 has generated ten indicators in transportation integration in Pacitan Regency, out of which only three have positive values and are positioned in Quadrant 2. The indicators show the intermodal, main mode, and route, having the importance and performance values that exceed the average. Consequently, the high importance and performance levels need to be maintained. The three indicators in Quadrant 1, namely connection mode, tariff, and time, require serious attention, because the performance is less than the average, despite being considered important by the respondents. The performance of the indicators must be continually improved in order to be placed in Quadrant 2. In Pacitan Regency, three out of ten transportation integration indicators are categorised in Quadrant 2, while the remaining seven have been positioned in the others, depicting a lack of comprehensive integration.

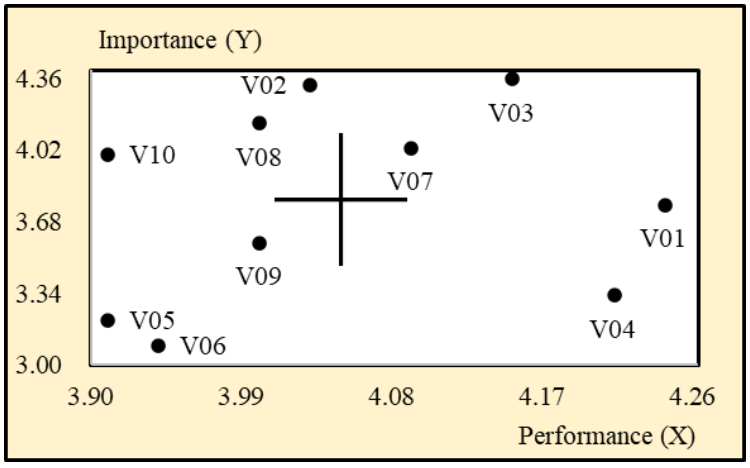

Figure 17. IPA for Transportation Integration in Pacitan Regency

3.4. CSI

CSI values for the quality of transportation integration indicators and the calculated results specific to this region are shown in Table 10. In addition, CSI value for the integration of transportation modes in hinterland region, obtained using a cobweb model, is shown in Figure 18.

Code	Indicators	Good integration indicator					Indicators of integration that need to be improved				
		Trenggalek	Tulungagung	Blitar	Ponorogo	Pacitan	Trenggalek	Tulunggung	Blitar	Ponoogo	Pacitan
VO1	Intermodal transportation	-	-	-	-	-	-	-	-	-	-
VO2	Connecting Modes	-	x	-	-	-	-	-	X	-	x
VO3	Main Modes	X	-	-	-	x	-	-	X	X	-
VO4	Multimodal network	X	x	X	X	-	-	-	-	-	-
V05	Transfer Point	-	-	-	X	-	-	-	-	-	-
V06	Transfer Points with different network	-	x	X	-	-	-	-	-	-	-
VO7	Route	-	x	-	X	x	X	-	-	-	-
VO8	Tariff	-	-	-	-	-	X	-	-	-	x
VO9	Schedule	-	-	-	-	-	X	-	-	-	-
V)10	Time	X	x	-	-	-	-	-	-	-	x
CSI		75.21%	84.59%	84.31%	65.59%	73.60%					

Table 10. CSI for Integration Quality Indicators (Source: Primary data processing results, Surabaya, 2022)

Table 11 shows that CSI indicator for Tulungagung and Blitar Regencies/Cities to have the highest value compared to those of Trenggalek, Pacitan, and Ponorogo Regencies. Tulungagung Regency/City have CSI indicator value of 84.59%, depicting a level of integration between good and very good, while Blitar Regency/City is 84.31%, falling in the range of good and very good. However, Trenggalek Regency records 75.21%, categorised as borderline, followed by Pacitan Regency with CSI indicator of 73.60%, depicting an integration level between the cause for concern and borderline. Ponorogo Regency has a value of 65.59 %, depicting a poor level of integration.

Figure 18 shows CSI indicator value for hinterland region using the cobweb model. Tulungagung and Blitar Regencies/Cities are exceptional, having the highest CSI values due to the presence of the dual transportation networks, comprising rail and land terminals. Meanwhile, Trenggalek, Ponorogo, and Pacitan Regencies lack the dual infrastructure setup, relying solely on land transportation network in the form of terminals.

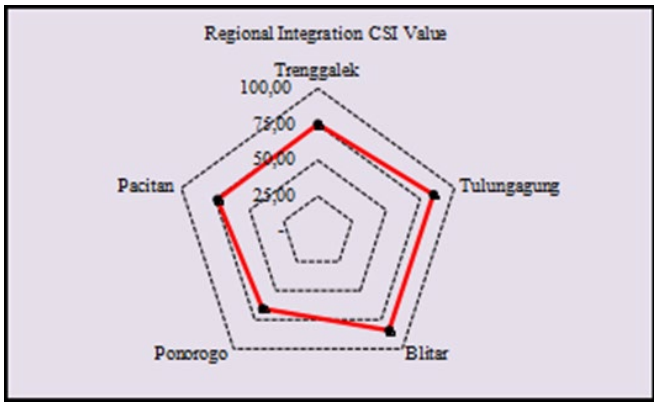

Figure 18. CSI for Regional Integration

3.5. Final Review Analysis

The establishment of Prigi Commercial Port was prompted by the imbalance in transportation sector between northern and southern regions of East Java Province. Prigi Beach was selected as the region of the port due to its maritime potential for developing into a commercial port. The construction activities started in 2018 and are currently ongoing, delaying the operational use. Positioned strategically along the southern route, connecting the Special Region of Yogyakarta to Malang, East Java (Widodo, 2017), Prigi Commercial Port benefits from the bay region, characterised by gentle waves, eliminating the need for constructing a breakwater.

Prigi Commercial Port is currently non-functional due to the incomplete facilities and infrastructure. In 2023, the construction efforts focused on major components such as a 10 x 75 m pier, an 8 x 55 m trestle, and an 8 x 250 m causeway. However, several essential facilities, including the expedition office, parking areas for both two- and four-wheelers, public warehouse, storage yard, port office, health clinic, and quarantine office, are still under construction. Supporting facilities, such as a mosque, generator house, toilets, fresh water tank, Wastewater Treatment Plant (WTP), fence, guard post, and lifting equipment, as well as a 12-ton crane and 3-ton forklift, are yet to be completed. In addition, the road infrastructure requires normalisation to accommodate heavy vehicles, addressing issues such as narrow roads, steep gradients, and sharp turns. The lack of road signs and street lighting along the route leading to the ports has added to the operational challenges. Despite these constraints, potential products for loading and unloading at the port include corn, roof tiles, marble, and eggs from West Nusa Tenggara (WNT), Trenggalek, Tulungagung, and Blitar, respectively, including promising tourism-related items.

4. CONCLUSION

The following conclusions have been obtained, based on the results and discussions hereby presented:

4.1. Integration

There were ten integration indicators in total, including main and connecting mode, routes, tariffs, time, intermodal transportation, and networks, transfer points, and those with different networks and schedules. In general, the entire hinterland has experienced partial integration.

- Trenggalek Regency needs a more effective integration, as only three out of the ten transportation mode indicators have been categorized in Quadrant 2. These include the main mode, intermodal network, and time indicators. The remaining seven indicators have been distributed across Quadrants 1, 3, and 4. The quality of the following indicators, intermodal transportation, connecting modes, transfer points, and those with different networks, routes, tariffs, and schedules, need to be improved in order to be positioned in Quadrant 2. Additionally, the route, tariff, and schedule indicators have been identified as region needing enhancement for a better integration.
- Regency has a more effectively integrated transportation network than the other regions. In IPA diagram, five out of the ten integration indicators have been categorised in Quadrant 2. These comprise connecting mode, intermodal network, transfer point with different networks, route, and time indicators. The remaining five integration indicators are to be found in Quadrants 3 and 4. However, the indicators in Quadrants 3 and 4 show a low importance and performance and have been ignored due to their excessive or inadequate nature.
- Blitar Regency/City has a low level of integration, as shown in IPA diagram. This is because only two out of the ten indicators have been positioned in Quadrant 2, specifically the intermodal network and transfer point with different networks. The remaining eight indicators have been distributed across the other quadrants. These comprise intermodal transportation, connecting and main modes, transfer points, routes, tariffs, schedules, and time. Therefore, in order to enhance the integration of transportation modes, it is considered necessary to improve the quality of the connecting and main

modes to enable transition into Quadrant 2.

- Ponorogo Regency has a lower optimal integration condition, as shown in IPA diagram. However, out of the ten indicators, only three have been categorized in Quadrant 2, namely the intermodal network, transfer point, and route. The remaining seven indicators, including intermodal transportation, connecting, and main modes, transfer point with different networks, tariff, schedule, and time, have been distributed across diverse quadrants. In order to enhance the integration of transportation modes, the major focus for improvement to transition into Quadrant 2 should be on the main mode indicator.
- Pacitan Regency shows a suboptimal integration condition, as depicted in IPA diagram featuring ten indicators. However, the following three indicators: intermodal transportation, main mode, and route are included in Quadrant 2. The remaining seven indicators have been positioned in the other quadrants. These indicators comprise connecting mode, intermodal network, transfer point, and those with different networks, tariff, schedule, and time. Improving the quality of the seven indicators has been necessary to categorise it in Quadrant 2, with a particular focus on the connecting mode, tariff, and time.

4.2. CSI

The values of CSI integration indicator in Tulungagung and Blitar Regencies are 84.59% and 84.31% respectively, depicting a level between good and very good integration. The value for Trenggalek, Pacitan and Ponorogo Regencies are 75.21%, 73.60, and 65.59%, indicating a borderline level of integration.

CSI indicators for Tulungagung and Blitar are considered the best because both regions had already established two different transportation networks, including rail and land terminals. However, Trenggalek, Ponorogo, and Pacitan had only a land transportation terminal.

4.3. Hinterland

Prigi Commercial Port has two hinterland layers, namely the inner and outer. The inner hinterland includes Trenggalek, Tulungagung, Blitar, Pacitan, and Ponorogo Regencies. Meanwhile, the outer hinterland comprises the central and northern regions, stretching from west to east or vice versa in East Java Province, which consists of Kediri, Nganjuk, Madiun, and Magetan Regencies.

4.4. Academic Relevance

This research has significance for both practitioners in regional port development and the academic community. In the academic sphere, it has shown how transportation integration can strategically position a company (port) to attain a competitive advantage by relying on resources, thereby ensuring sustained and continuous development.

4.5. Research Summary

The construction of Prigi Commercial Port in Trenggalek Regency was completed in 2018, although it had remained non-operational due to incomplete facilities and infrastructure. Transportation system in the five hinterland region so far lacks proper integration, except in Tulungagung Regency, where transportation system is well integrated. Meanwhile, the other four regions still need to improve their integration efforts.

This research has several limitations, which may be listed as follows:

- The literature on previous results is limited, posing challenges in research, and leading to many weaknesses, both in terms of results obtained and analysis conducted.
- Constraints related to time, costs, and energy have impacted the effectiveness of this research, leading to suboptimal outcomes.
- This research solely focuses on transportation integration system in the hinterland region of Prigi Commercial Port.
- During the data collection process, discrepancies may arise in the information provided by respondents through questionnaires and interviews, potentially not reflecting their true opinions. This is due to differences in thoughts, assumptions, and understandings among the respondents, and other factors, such as the honesty factor in filling in the questionnaires.

Future research should therefore focus on how to develop commodities, industries and trade in the hinterland region of Prigi Commercial Port, along with assessing the prospects. The process is important because the viability of Prigi Commercial Port focuses on the availability of commodities to be unloaded. The success of the port depends on a flourishing trade network and a steady supply of commodities.

4.6. Recommendation

- The central, provincial, and regency or city governments need to adopt a two-fold approach to enhance transportation system. Firstly, there is a need to prioritise maintaining and strengthening the already effective indicators, such as intermodal network, route, transfer point with different networks, and time. Secondly, efforts should be directed towards developing currently ineffective indicators, such as the main and connecting modes, route, schedule, tariff, and time.
- The central, provincial, and district or city governments need to promote an increased integration of transportation modes in Trenggalek, Tulungagung, Blitar, Ponorogo, and Pacitan Regencies.
- The provincial and regency or city governments need to build points for the loading and unloading of goods across the entire inner hinterland.
- Trenggalek Regency Government should construct a loading point or depot in Durenan region (Trenggalek Regency), as well as improve the district roads in the inner hinterland.
- Tulungagung Regency Government need to build a loading point or depot in Bandung Campur Darat region (Tulungagung Regency), including improving the district roads in the inner hinterland.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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