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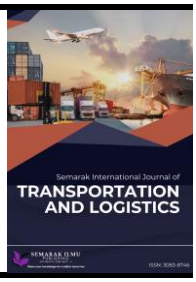

Evaluating the Port Competitiveness to Select a Regional Hub Port in BIMP EAGA: The Perspective of Industry Experts

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ABSTRACT

In the rapidly evolving landscape of international trade and economic integration, the BIMP-EAGA (Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area) region holds significant promise as a critical node for regional connectivity. The establishment of a regional hub in BIMP EAGA would significantly improve connectivity by serving as a central point for consolidating cargo from smaller ports, resulting in more efficient transportation networks. This consolidation has the potential to reduce freight costs and logistical expenses, ultimately enhancing economic integration and trade within the region. The objective of this study is to evaluate the most important attributes of port competitiveness to select a regional hub port from the perspective of the industry experts in BIMP EAGA region. This study employs the Analytic Hierarchy Process (AHP) methodology to evaluate the most critical attributes of port competitiveness and subsequently conducted a semi-structured interview with industry experts to obtain their perspective and affirmation on the outcome of the AHP survey. The study engaged 20 participants from various related sectors for the AHP and consultation with six industry experts from the maritime and transportation sectors. The findings offer actionable guidance for policymakers, port authorities, and industry participants, facilitating strategic decisions and targeted investments to enhance regional connectivity

1. Introduction

Intra-Asia trade primarily involves trade among Asian countries, encompassing East Asia, Southeast Asia, South Asia, Central Asia, and Western Asia. Asia is home to a wide range of economies with varying levels of development, industrialization, and specialization. China, Japan, South Korea, India, and various ASEAN countries are significant players in intra-Asia trade. China, in particular, has

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emerged as a major trade hub and manufacturing center for the region. This diversity results in the exchange of a broad spectrum of goods and services, from raw materials to high-tech products. Asia boasts several major trade routes, such as the East Asian shipping lanes and land routes connecting Central Asia to major markets. These routes facilitate the flow of goods and play a crucial role in regional and global trade. In terms of economic integration as Asian countries are members of regional trade blocs and organizations, such as ASEAN (Association of Southeast Asian Nations), APEC (Asia-Pacific Economic Cooperation), and AEC (ASEAN Economic community). These organizations promote economic integration and trade cooperation among member states.

In Southeast Asia, governmental cooperation, notably through organizations like ASEAN, has undertaken substantial initiatives aimed at addressing the socio-economic challenges present in their less developed sub-regions. In consonance with ASEAN's objectives, the Brunei Indonesia Malaysia Philippines East ASEAN Growth Area (BIMP-EAGA) was established in 1994 with the primary mission of fostering the socio-economic advancement of their underdeveloped and geographically remote territories. The participating nations in BIMP-EAGA encompass the entirety of Brunei Darussalam, Sabah, Sarawak, and Labuan in Malaysia, as well as North, Central, South, and Southeast Sulawesi, Central, East, West, and South Kalimantan, Maluku, and Irian Jaya in Indonesia. Additionally, the region includes Mindanao and Palawan in the Philippines. One of the most significant challenges faced by EAGA is the geographic discontinuity created by substantial distances and bodies of water, which poses a considerable obstacle to seamless connectivity. Furthermore, the areas rich in agricultural and tourism resources are situated on numerous smaller islands in Indonesia and the Philippines, adding an extra layer of complexity to the task of establishing effective regional connectivity (BIMP EAGA Roadmap to Development, 2006) [1]. The majority of ports within this geographic area (refer Figure 1) rely heavily on the concentration of cargo at their respective national hub ports. Major Liner Operators (MLOs) opt to centralize their operations at these major ports to benefit from increased cargo volumes, resulting in lower freight costs. Cargo designated for smaller ports situated throughout the region necessitates an additional step in the logistics process involving feeder vessels. This practice leads to heightened logistical expenses due to the need for double handling and extended transit times to reach their intended destinations. At the same time, to address the contemporary challenges associated with meeting the demands of today's shipping industry, a port can enhance its competitive positioning by providing port users with an attractive and competitive package compared to other interconnected ports, as highlighted by previous study [2].

Port competitiveness refers to a port's ability to excel over other ports in attracting trade, logistics, transportation, and industrial businesses [3]. This encompasses the port's capability to gain a competitive edge by improving its infrastructure, providing high-quality services, and achieving cost-efficiency. To enhance port competitiveness, essential strategies include improving operational efficiency, raising service quality, and implementing cost-cutting measures [4]. Based on the literature review of key drivers of port competitiveness studied by Parola *et al.,* [5], the most common researched are port cost, hinterland proximity, hinterland connectivity, port geographical location, port infrastructure, operational efficiency, port services quality, maritime connectivity, nautical accessibility, port cite and others.

There are findings [6] on the global container terminal selection for transhipment hub were the 'handling cost of containers,' 'proximity to main navigation routes,' 'proximity to import/export areas,' 'basic infrastructure condition (e.g., depth of water),' and 'existing feeder network' emerged as the top five service attributes.

Port competitiveness is a critical factor influencing global trade, driven by various elements such as infrastructure, operational efficiency, connectivity, and cost-effectiveness. Due to the

multifaceted nature of these determinants, researchers often employ Multi-Criteria Decision-Making (MCDM) methods to assess and rank port performance [7-11]. Among these, the Analytic Hierarchy Process (AHP) stands out as a widely used technique due to its structured approach in breaking down complex decisions into simpler, hierarchical components. AHP allows decision-makers to prioritize criteria and alternatives through pairwise comparisons [12,13]. However, traditional AHP may struggle with handling the inherent uncertainty and subjectivity in expert judgments. To address this limitation, advancements like Fuzzy AHP have emerged, incorporating fuzzy logic to better capture ambiguity and provide more accurate assessments [14,15]. This hybrid approach enhances decision quality, making it a valuable tool for evaluating port competitiveness in dynamic and uncertain environments.

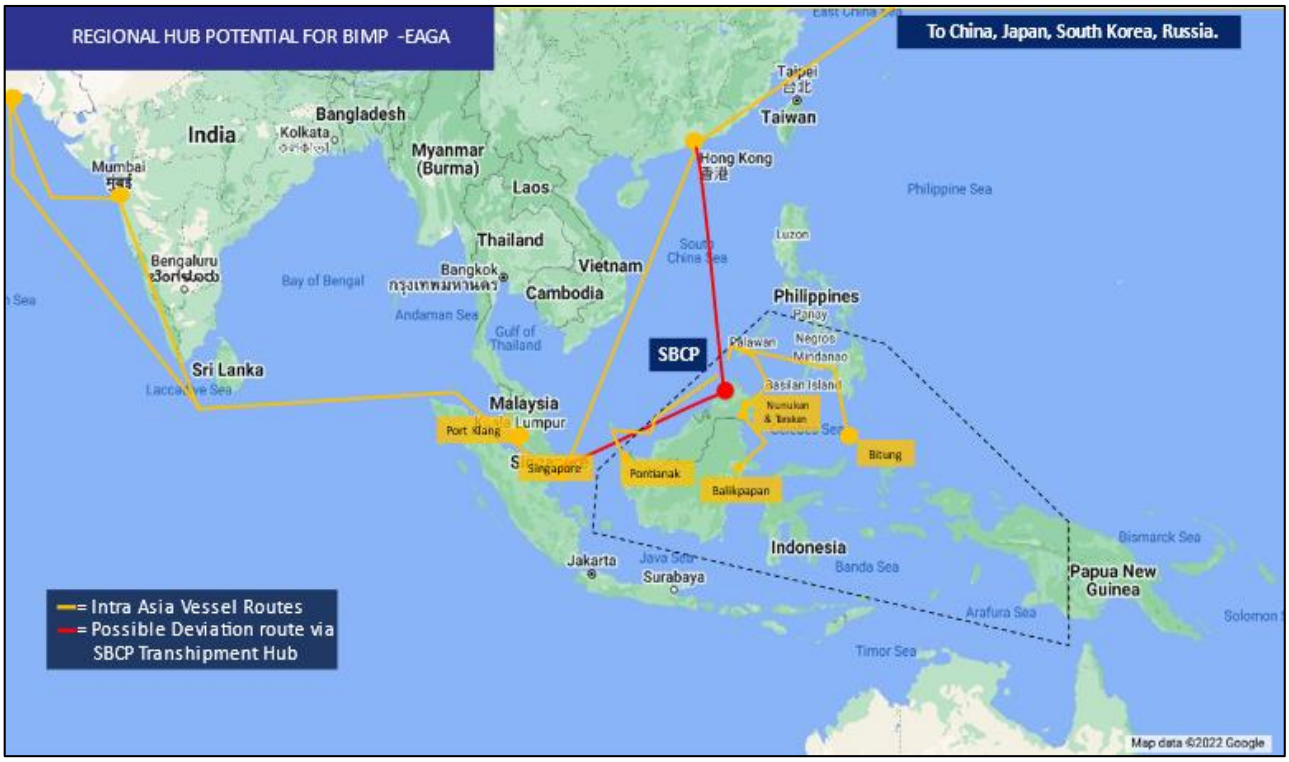

Fig. 1. Sabah Ports 2023

2. Methodology

This study used a mixed approach of qualitative and quantitative methods. In this study the Analytical Hierarchy Process (AHP) and consultation with industry experts with semi-structured questions will be applied. This approach enables experts to transform subjective assessments into objective metrics [16,17]. The semi-structured interview format represents a hybrid approach that combines elements of both structured and unstructured interviews. In this method, predetermined questions are formulated before the interview, and it allows the interviewee the opportunity to expound upon and elucidate specific topics by employing open-ended inquiries.

The port competitiveness attributes were observed from literature review and preliminary set of questionnaires was developed. The methodology involved reviewing relevant literature with respect to port competitiveness and from the existing literature, a list of critical factors selected by the stakeholders is used as a list of critical factors choose by the author to develop a questionnaire. As shown in Table 1, there are five main attributes, and 19 sub-attributes were selected.

Table 1
Port Competitiveness Main and Sub – Attributes.

Goal	Main Attributes (5)	Sub-Attributes (19)
To identify the level of importance of Port competitive-ness to select the Port To be the Regional Hub by industry expert	Hinterland Characteristic (HC)	The availability of import and export cargoes within the local hinterland. (HC1)
		There must be sufficient volume of import and export of goods within the regional hinterlands to be transshipped at the Port. (HC2)
		There must be an efficient intermodal connectivity within the hinterland to the port.(HC3)
	Maritime Accessibility (MA)	The port must be located in a strategic location, e.g. situated nearby the international trade lane/point of connectivity to the hinterlands (MA1)
		The depth of the approach channels to enter the port limit must be sufficient to allow for a safe passage for the transshipment vessels (MA2).
		Sufficient draft at berthing terminal to cater for a minimum size of Main Liner Operators (MA3)
		The sailing frequency of Main Liner Operators and/or feeder vessels to the port should be consistent. (MA4)
	Efficiency on the Port Facilities and Port Operation (EP)	There must be a suitable equipment available to maintain terminal's efficiency for transshipment vessels. (EP1)
		There must be a consistent operational efficiency on the quay side and yard for a fast turnaround time of vessels at berth (EP2)
		There must be a consistent operational efficiency in the terminal (yard area) for fast turnaround time of hauliers. (EP3)
		There must be a shorter dwell time and fast turnaround time of containers in port. (EP4)
	Port Pricing and Port Support Services (PP)	The port must have a competitive Port Tariff compared to neighbouring ports. (PP1)
		There must be an efficient cargo documentation clearance by Port and Authorities. (PP2)
		The availability of electronic single window system for seamless operation (PP3)
		The availability of ancillary services such as bunkering and fresh water supply. (PP4)
	Institutional Regulatory Framework (IR)	There must be a clear line of jurisdiction and aligned policies in term of maritime policy among local Authorities. (IR1)
		The Authorities need to ensure security policy to be in place to provide a safe passage within coastal waters.(IR2)
		To provide effective trade facilitation to enhanced bilateral trade. (IR3)
		There must be a political stability in the state to give confidence to investors and to provide conducive environment for economic development. (IR4)

The AHP survey were carried out to 20 respondents summarised Table 2. These companies represent a diverse range of stakeholders, including shipping lines, shipping agents, freight forwarders (representing the shippers), port authorities, and port operators who have experience with ports in Borneo and possess familiarity with the economic conditions in the BIMP EAGA region. The survey was administered in person, in order to explain the purpose of the survey. After a two-week period, the questionnaires were collected from the participants. These comparisons are made using a scale of absolute judgments that represent the dominance of one element over another [18]. It's important to note that, in this study, the focus is primarily on the fundamental aspects of port competitiveness of container shipping lines in the BIMP EAGA region, and therefore, the feedback from the industry experts is based on the experience and knowledge of the region and the ports they used.

Table 2
Sea Ports Users or Respondents by Category

Category	Description	Company/ Association	No. of Respondents (20)
Shipping Companies	Companies that operate cargo ships, container vessels, bulk carriers, and other types of ships to transport goods between ports. They are primary users of seaports.	MTT Shipping, RCL Shipping, Harbour Link, ShinYang Shipping,	5
Importers and Exporters (shippers)	Companies engaged in international trade rely on seaports to import goods into a country or export products to foreign markets.	Federation of Sabah Industries (FSI), FMM	3
Freight Forwarders and Logistics Providers	These intermediaries manage the transportation and logistics of goods, including arranging for cargo to be transported via seaports.	Freight Forwarders Sabah	5
Port Authorities/ Port Operators	These are organizations or government agencies responsible for managing and operating the seaport facilities, including maintaining infrastructure, safety, and security	Lembaga Pelabuhan-pelabuhan Sabah, Sabah Port SB, Bintulu Port Authority,	3
Shipping Agents	Agents act on behalf of shipowners and charterers, handling various administrative and logistical tasks.	Sabah Shipping Association	4

Table 3
Demographic of the Industry Experts

Respondents & highest qualification (6)	Designation	Age Group	Experiences	No. of years active in the industry
Respondent 1 Master of Foreign Going (Captain)	Managing Director	50 above	Seafarer (Foreign Going), Port operation, maritime & logistics	More than 25 years
Respondent 2 PhD in Economics	Marketing Director/ Consultant	70 above	Port management & operation, vast experience & knowledgeable in SEA maritime sectors	More than 40 years
Respondent 3 PhD in Economics	Managing Director/Consultant	55 above	Logistics & transport, knowledgeable and experience in BIMP EAGA	More than 25 years
Respondent 4 Master of Science (Maritime)	Chief Executive Officer / Board member	70 above	Port management & operation, maritime industry	More than 40 years
Respondent 5 PhD in Industrial Engineering & Operations Research	Principal Consultant	40 above	Macro- economic study on cargo forecast in all types of cargo, analysis competition, financial feasibility study	More than 20 years
Respondent 6 Accountant	Senior Director of global port operator/ consultant	55 above	Port management, Free Zones, business development	More than 25 years

In the next stage, the industry experts (summarised in Table 3) were consulted to obtain their opinion on the AHP result to attest the selection of most important attributes that have significant impact to stakeholders to select a regional hub port in the region.

3. Results

In the first phase on the research, based on AHP, the attributes were ranked based on its importance concerning the port competitiveness. However, in this paper, further analysis focused on the top ten ranked sub-attributes, as detailed in Table 4. This analysis aimed to derive conclusions concerning the relative importance of the main attributes in the decision-making process. The ranking of the sub- attributes was based on the calculated global weights, The sub-criterion with the highest relative weight was considered the most important, and the one with the lowest weight is considered the least important within that level.

Table 4
The 10th Most Important Sub- attributes

Sub-Attributes of Port Competitiveness	Local Weightage	Global Weightage	Ranking
EP2: There must be a consistent operational efficiency on the quay side and yard for a fast turnaround time of vessels at berth.	0.341	0.121	1
EP1: There must be a suitable equipment available to maintain terminal's efficiency for transhipment vessels.	0.308	0.109	2
PP2: There must be an efficient cargo documentation clearance by Port and Authorities	0.325	0.090	3
PP1: The port must have a competitive Port Tariff compared to neighbouring ports.	0.314	0.087	4
HC1: The availability of import and export cargoes within the local hinterland.	0.5612	0.080	5
EP4: There must be a shorter dwell time and fast turnaround time of containers in port.	0.181	0.064	6
PP3: The availability of electronic single window system for seamless operation	0.229	0.063	7
EP3: There must be a consistent operational efficiency in the terminal (yard area) for fast turnaround time of hauliers	0.171	0.060	8
MA1: The port must be located in a strategic location, e.g., situated nearby the international trade lane/point of connectivity to few hinterlands whether by sea and land transport.	0.4053	0.052	9
PP4: The availability of ancillary services such as bunkering and fresh water supply.	0.133	0.037	10

The findings revealed that all sub-attributes (EP1, EP2, EP3, EP4) falling under the Main Attribute of Efficiency of Port Facilities and Operation (EP) and all sub-attributes (P1, P2, P3, P4) belonging to the main attribute of Port Pricing and port ancillary services (PP) were positioned within the top ten rankings. The remaining two sub-attributes encompassed the availability of import and export cargoes within the local hinterland (HC1), situated within the main attribute of Hinterland Characteristics (HC), and the requirement for the port to be strategically located, such as its proximity to international trade lanes or key connectivity points to various hinterlands, whether through sea or land transport (MA1), situated within the main attribute of Maritime Accessibility (MA).

The outcome from the AHP survey were affirmed by consultation with the industry experts. According to a study [19], expertise in the industry can manifest in two ways. The first type is characterized by within-industry expertise, indicating the analyst's deep understanding of the economic factors influencing the performance of companies within the industry, as well as their capacity to assess and rank these firms. The second form is known as a cross-industry expertise, demonstrating the ability to evaluate the industry's prospects in relation to the broader market and other industries. The six-industry expert as presented in Table 3 have responded to a semi-structured

interview performed face to face and by online communication through Webex and Team. Their perspective on the three most important attributes were reaffirmed. The opinions from industry experts are summarised in Table 5.

Table 5
Responses from Experts

Efficiency of Port Operation & Facility
Port operation efficiency and port infrastructure are crucial factors for port users because they directly impact the cost, reliability, and effectiveness of transportation and logistics networks. Taking Sabah Ports as an example, most of the cargo are transported from Port Klang by main liners and cargoes for Sabah and Sarawak are carried by feeder vessels to East Malaysia. Import and export cargoes needs to go through these routing due to most main liners are calling bigger ports and better infrastructure in Peninsular Malaysia. Efficient port operations and well-maintained infrastructure can significantly reduce shipping costs. Ports that can handle cargo quickly and with minimal delays help to lower transportation expenses. Delays in loading and unloading cargo can disrupt supply chains and lead to increased holding costs for inventory. Faster turnaround times mean quicker delivery of goods to their destination. Port users depend on the reliability of port services and infrastructure. Consistent operations reduce the risk of unexpected delays or disruptions in the supply chain, helping businesses meet customer demand and maintain their reputation. Ports that invest in modern infrastructure and technology are better equipped to handle increasing cargo volumes efficiently. Port users who can rely on efficient ports gain a competitive advantage in the market by ensuring their products reach customers promptly.
***Availability of Local Cargo*.**
The presence of a robust local hinterland holds paramount significance for port stakeholders especially shipping lines, as it is imperative for them to encounter a sufficiently substantial cargo volume to rationalize their decision to make port calls. A vigorous local hinterland characterized by a diverse array of industries and a robust economic milieu can ensure a consistent influx of import and export cargo, rendering a particular port an enticing prospect for maritime shipping lines. Consequently, the presence of a well-established and efficient local hinterland assumes pivotal importance in the deliberations of maritime shipping operators when contemplating whether to include a specific port in their itinerary. In this context, it is noteworthy that the port in Sabah boasts an expansive hinterland encompassing the immediate hinterland of the State of Sabah, an extended hinterland spanning Northern Borneo Island (comprising East Malaysia and Brunei Darussalam), and a prospective Regional hinterland encompassing the broader BIMP-EAGA.
Strategic Location
In the realm of maritime commerce, the acquisition of strategic maritime access assumes paramount importance for shipping lines, as it enables them to forge pathways to novel markets and augment their customer base, thereby fostering business expansion. The deliberate selection of a strategically advantageous location in proximity to international trade routes, coupled with robust hinterland connectivity, underscores the recognition that these elements wield a more profound influence on trade efficiency, market accessibility, and operational efficacy than the sole consideration of sailing frequency and feeder vessel operations. Port in a strategic location in proximity to major international trade corridors, coupled with minimal diversions, increase the potential of the port to establish itself as potential primary gateway to the BIMP EAGA region. It is noteworthy, however, most of the industry expert have accorded strategic location second in rank. This ranking stems from the realization that a strategically advantageous location, in isolation, does not yield substantial value unless complemented by factors such as port efficiency and infrastructure, competitive pricing structures, and the availability of robust local hinterlands.

4. Conclusions

From an industrial perspective, both Ports Authorities and operators can explore opportunities for improvement and engage with customers to assess their satisfaction levels with port efficiency. Benchmarking against other regional ports can provide valuable insights [20]. Additionally, pricing should align with the level of service provided. The study's limitations include the need to consider additional factors such as maritime security and environmental considerations, the inclusion of various categories of port users in the assessment, and conducting benchmarking with major ports in the BIMP EAGA region will be an added value to gain insights of most suitable port to be selected as a regional hub port .

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