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MEASUREMENT OF PORT CITIES – A SYSTEMATIC LITERATURE REVIEW APPROACH

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ABSTRACT

A port city is a city that engages in port and maritime activities and also develops land and maritime economic activities. However, the concept or the tools to measure whether a seaport has achieved the criteria of port-city is still lacking. This paper aims to identify the port city measurement and to propose a novel framework for extending port city development as a tool to improve the maritime tourism sector. This paper adopted a traditional systematic literature review (SLR) with content analysis to code the outcome. The final results indicate that only seven articles validated outcomes from the Scopus database. Based on the global view outcome, there are only six main clusters and 27 sub-factors influencing the development of port cities. The six main clusters were: port characteristics; the awareness of maritime stakeholders, port intensity, vessel characteristics, information technology, and the government's role. The new strategies could lead to a digitalization of decision-making methods in smart maritime tourism in port city development.

Keywords: Port Cities, Maritime Tourism, Smart Maritime Tourism, Systematic Literature Review

Introduction

A Port city is a city carrying out maritime activities and developing economic activities between the land and the offshore interface. The cultural, social, and economic life of the cities in which ports are located, as well as the links that ports provide to the rest of the world, are all significantly impacted by the presence of the ports (Zain *et al.*, 2022). Ports are essential to the growth of an economy because they make it easier to conduct business and add something of value to both the port and the city. This, in turn, increases the opportunities available to regional, national, and even international companies that have their headquarters there (Rodrigue & Schulman, 2017; Jeevan *et al.*, 2022). As major actors in the cultural, social, and economic life of cities, Ports provide economic well-being and support a strong identity for those cities and their local communities.

This is because ports are major players in the life of cities (Angela & Rodrigo, 2020; Zain *et al.*, 2022).

Many cities have increased their port operations by expanding onshore through land reclamation into the sea. Many more cities have invested significantly in infrastructure serving port areas, such as enlarged industrial areas, expanded highways, or improved access to intermodal alternatives, such as ship-to-rail terminals.

Moreover, the impact of ports on a city economy can be measured through the direct effects concerning the cargo volume, actual employment and gross value related to the activities carried out in the port area; the backward linkages, the indirect employment connected with the services to the port area and the forward linkages including those activities which would not take place in the city without the presence of the port (Tan, 2007). These expansions show how many cities have expanded their port operations (Vellinga and De, 2012; Monios *et al.*, 2018).

Ports are essential nodes on the global stage, playing an indispensable part in the conduct of international maritime commerce as well as the transportation of people. Most of the research was conducted to identify the seaport competitiveness, how to improve seaport by integrating Industrial Revolution 4.0 and the impact of COVID-19 on the

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maritime industry (Salleh *et al.*, 2017; Salleh 2021; Menhat *et al.*, 2021). In accordance, Zain *et al.* 2022 also researched the definition of seaport-city integration, the advantages and disadvantages gained by the city from the seaport and vice versa. A strategy to enhance the integration between seaport and city through dry ports was also discussed. Hence, this research was conducted to close the gaps in the preview literature review. This paper aims to identify the port city measurement, and a novel framework for extending port city development as a tool to improve the maritime tourism sector is proposed.

Maritime and Port Cities

Reliance on a single distribution centre and intra-regional trade Cities continue to play an important role in facilitating global trade flows (Verhetsel & Sel, 2008). Corporations are seeking ways to capitalise on new opportunities while also managing their exposure to rapidly changing markets. According to UN estimates, more than half of the world's population now lives in cities, with two-thirds of the world's population expected to live in cities by 2050 (Wang & Ducruet, 2012). City regions will become even more important in the future, especially given that more than half of the world's cities and urban populations are within 100 kilometres of a coastline (Chhetri *et al.*, 2018).

According to population estimates and projections, metropolitan areas worldwide will continue to grow rapidly due to increased urbanisation. As cities grow in size, there is more competition among them to serve as international transportation, logistics, and services hubs, which include the main modes of long-distance transportation, maritime shipping, air passenger services, and air freight services, among others. When we look at the world's most important maritime hubs, we can see that they set a good example. The maritime business

services sector significantly contributes to the economies of several major world cities with a strong commercial orientation (Chhetri *et al.*, 2018).

Maritime and commodity trading services are available in many of the world's largest port cities. The presence of shipowners, port-related industry, and general advanced producer services are all related to the location of advanced maritime producer services (AMPS) but not to port throughput flow (Chhetri *et al.*, 2018). To some extent, the concentration of advanced maritime services and the physical movement and movement of goods, ships, and people has resulted in a spatial division of labour. Only a few port cities, including Rotterdam, Houston, Shanghai, Dubai, and Hamburg, have successfully combined physical flows on a large scale in AMPS functions, following in the footsteps of London, New York, Singapore, and Hong Kong (Akhavan, 2017). Economic changes in the twentieth century resulted in the reorganisation of port activities and how they use the land available (Ducruet, 2011). Increasing tensions between urban and port expansion caused some activities to be relocated downstream via port migration processes, resulting in land use abandonment or intense reduction.

Ancient port areas were abandoned, and the city-port connection began to deteriorate. Ports typically paid little attention to activities involving the reclamation of neglected areas, instead allowing them to deteriorate or renting them out to industries unrelated to the port's primary business (Lam & Yap, 2019). Many cities worldwide have developed a complicated relationship with their port because they owe their very existence to them. The issue of sustainability is high on the agenda as cities and ports collaborate to shape their future relationships (Xiao & Lam, 2017).

Methodology

Step one - Define keywords

Port City And Measurement

Step two - Preliminary findings:

The keywords mentioned above were used to search articles' titles, abstracts,

and keywords in the Scopus databases. According to the preliminary results, approximately 58 articles were found in the Scopus database. Table 1 shows the preliminary findings:

Table 1: Preliminary Findings

1. Port City and Measurement	58
Total	58

Step three - Refining the initial results:

To further refine the results and improve the quality and interpretation of the results, four criteria were included below:

- Time Frame: 2011 to 26th December 2021
- Subject Area: (Social Science), (Business, Management and Accounting) & (Multidisciplinary)
- Document Type: Journal
- Language: English

Table 2: Result

1. Port City and Measurement	7
Total	7

Step four- Final results

The final results indicate that only 7 articles validated outcomes from the Scopus database

Step five - Data analysis

The results were subjected to content analysis to explore the measurement of port city development (global view).

Results

Based on the systematic literature review outcome, seven papers were investigated to achieve the aim of this paper. Moreover, the content analysis was used to retrieve the findings from the articles. Table 3 below shows the SLR findings.

Table 3: SLR Findings

No.	Authors	Title	Source	Year	Findings
1.	Guo J., Qin Y., Du X., Han Z.	Dynamic measurements and mechanisms of coastal port–city relationships based on the DCI model: Empirical evidence from China	Cities	2020	<ul style="list-style-type: none"> • Port sizes influence internal structural changes in the port–city • The regional characteristics of the port–city relationship • Regional features • port sizes and structural changes to city development • Nature of developing countries and new factors of port city development in the new era of globalisation • Development status of port cities by comparing the development of each port city.
2.	Cao X., Li S.	Spatio-temporal evolution of port opening in China's 40 years of reform and opening-up period	PLoS ONE	2019	<ul style="list-style-type: none"> • Port logistics intensity • Passenger flow intensity • Port city foreign-trade volume • Port foreign-trade logistics intensity • Port export logistics volume • Port import logistics volume • Port external market coverage • Port international passenger intensity • Port outbound passengers • Port inbound passengers • Port city foreign-trade amount • Port city export trade amount • Port city import trade amount
3.	Merico E., Dinoi A., Contini D.	Development of an integrated modelling- measurement system for near-real-time estimates of harbour activity impact on atmospheric pollution in coastal cities	Transportation Research Part D: Transport and Environment	2019	<ul style="list-style-type: none"> • Internal combustion engines of ships • Contribution to shipping and harbour activities • Influence of ship traffic • Mobile or stationary measurements • Integrated approaches • Development and applications of portable (small) online sensors

4.	Chen C., Lam J.S.L.	Sustainability and interactivity between cities and ports: a two-stage data envelopment analysis (DEA) approach	Maritime Policy and Management	2018	<ul style="list-style-type: none"> • Long-term nature of port investments • Socio-ecological transition • Balancing the conflicting interests among stakeholders and fostering economic significance • Significant relationship with the regional economy • Green port concept, in conjunction with green shipping dimensions of energy consumption, • Environmental protection and ecology care • Dimensions of environmental quality, • Use of energy and resource waste handling • Habitat quality and greenery, and social participation • Dimensions of air pollution management, • Liquid pollution management • Solid waste management • Other pollutants management • Aesthetic noise control management • Marine biology preservation • Seaport physical characteristics • Berth length • Number of cranes • Land area • Energy consumption
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5.	Merico, E., Dinoi, A., & Contini, D.	Atmospheric impact of ship traffic in four Adriatic-Ionian port-cities: Comparison and harmonisation of different approaches	Transportation Research Part D: Transport and Environment	2017	<ul style="list-style-type: none"> • Harbour/industrial activities on gaseous emissions • Mobile laboratory to check air quality • Emissions inventories
6.	Tichavska M., Tovar B.	Environmental cost and eco-efficiency from vessel emissions in Las Palmas Port	Transportation Research Part E: Logistics and Transportation Review	2015	<ul style="list-style-type: none"> • Eco-efficiency performance by evaluating environmental (emissions) • Economic factors (production) • Support the design of policy instruments • Air quality • Energy conservation • Noise management • Waste management • Water management
7.	Winnes H., Fridell E.	Emissions of NOx and particles from manoeuvring ships	Transportation Research Part D: Transport and Environment	2010	<ul style="list-style-type: none"> • Emission measurements for the main engines • Pollutant concentrations in ship exhausts

Interpretation of the Result

Figure 1 below shows the six clusters and 27 sub-factors to measure the port-city development that is required globally. These measurement factors were required to ensure the efficiency of national growth for the successful development of a port city.

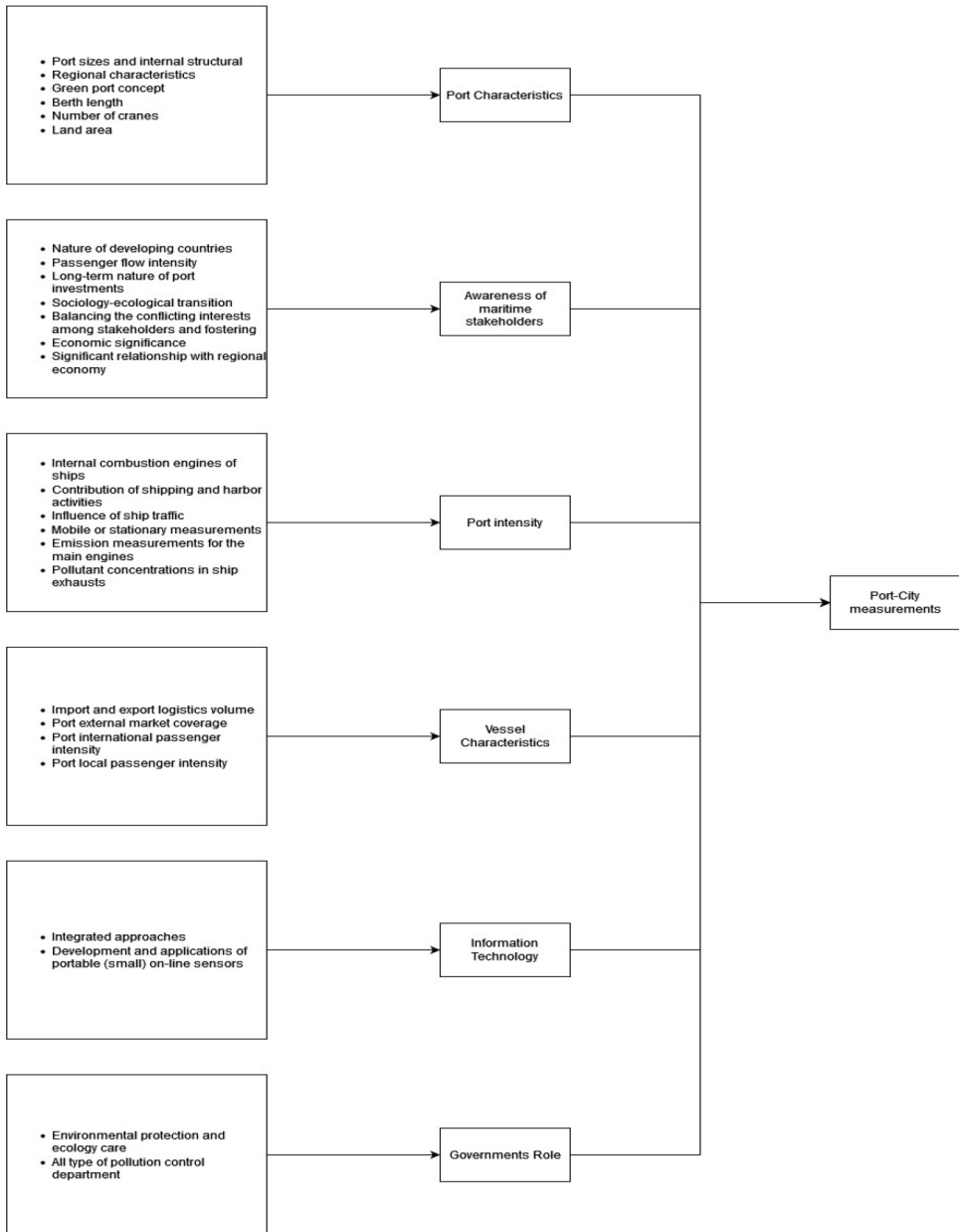


Figure 1: Six clusters and 27 sub-factors

Discussion

Ports are transportation hubs on bodies of water, such as the ocean or a river, and are outfitted with waterway intermodal equipment to ensure ships' safe entry and exit. Ports may also be referred to as harbours. By taking into account each of these aspects, the development of the port city harbours the belief that it will be able to make a positive contribution to the economy's growth as a whole. The establishment of a port city, which comes with a variety of advantages, requires the presence of a port as a precondition. Direct output, national income, employment opportunities, and tax revenue are all generated for the city by the production of ports, the operation of ports, and the development of ports; the intensity of the port has a direct correlation to these factors. The expansion of import and export trade, contemporary industry, and contemporary modes of transportation have contributed to the financial success of the world's first port cities and the development of new port cities such as Singapore, Shenzhen, Hong Kong, and Dubai.

Apart from that, port characteristics play an important role in port city development. The adequacy of port infrastructure, facilities, and equipment are the most important factor in the development of the port city (e.g., warehouse, crane, berth, telecommunication, breakwater and good water quality). Moreover, integrating with advanced technologies, for example, Augmented Reality, Virtual Reality, Big Data, will progress the development of port-city. In addition, there is a requirement for adequate infrastructure in the area surrounding or close to the port, such as roads, railways,

bridges, telecommunications, buildings, spaces, and homes, in addition to specific routes or roads for heavy vehicles. In port cities' development, activities related to cargo handling were thought to be a key generator of local jobs, taxes, and economic activities. According to Chan and Yip (2011), ports in various regions continue to develop their facilities to make them more competitive with those of other regions and to meet the growing demand for sea transport. Some ports have set their sights on becoming the ones with the highest container port throughput in the world.

Apart from that, the government should play an important role in taking care of the environment and any pollutants that could harm the environment. For instance, the government could establish a policy requiring every port to have its environmental department to ensure it is as environmentally friendly as possible. By creating a pollution-free port city, a new maritime tourism sector, known as seaport tourism, can be attracted and developed within the port itself. Seaport tourism, known as an activity, could occur in the port limit, for example visiting the port environment, loading and unloading cargoes, watching vessel berthing and casting off, etc. Furthermore, incorporating elements of the Industrial Revolution (IR) 4.0 in the seaport sector to transform maritime tourism into smart maritime tourism (SMT) is a novel approach resulting from the new wave of digitalisation. The SMT is a solution that is both effective and efficient, and it can help the seaport gain more profits. Figure 2 below summarises the novel framework to extend the maritime tourism market into port city development.

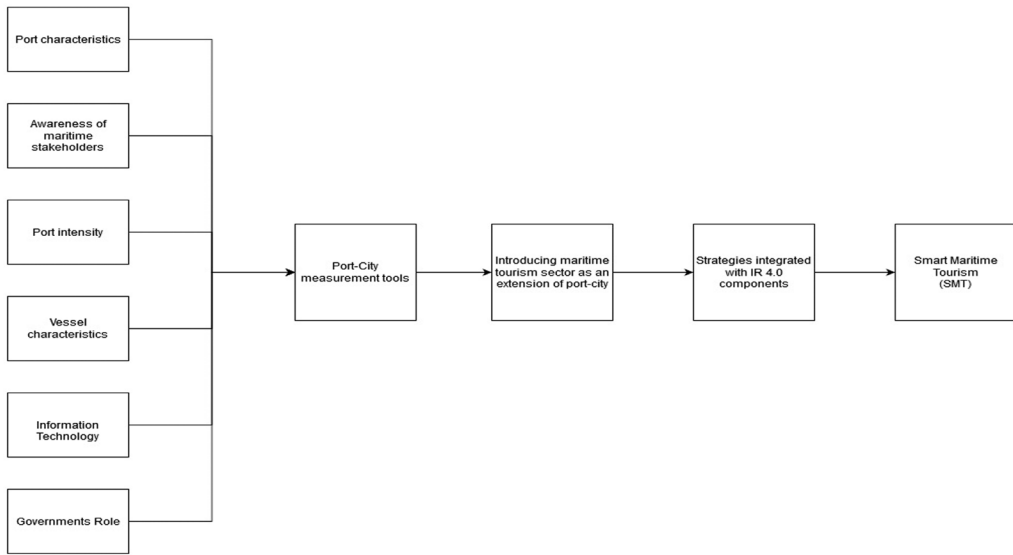


Figure 2: Novel framework to extend maritime tourism market into port city development

Conclusion

Apart from being centers of economic activities and trade for maritime nations, ports are also fascinating to people because of the activities that go on there. Based on the outcome, six clusters and 27 sub-factors are needed globally to measure port-city development. For a port city to successfully develop, these measurement criteria were necessary to guarantee the effectiveness of national growth. Even when the citing of ports and ports services industries consume much of the foreshore lands and livelihoods of original settlers of port lands, the inhabitants continue to squeeze themselves to fit into what is remaining of their original land space. New skilled and unskilled settlers are still further attracted to the port precinct in search of economic survival. While this influx of uncontrolled people traffic is a symptom of negative externality, it nonetheless shows the love and attraction that people have for ports and port cities.

Given the preceding discussion and recommendation, introducing smart maritime tourism into the economic lives of port cities will not only serve as a booster to the cities’ economic lives but the fact that tourists are not permanent residents of the port cities also always the fear of the local populace of potential increased congestion. The tourists must spend money – on their conveyance, feeding, accommodation, sightseeing, shopping, and even medicals. Clearly, huge chunks of these monies go into the host port cities, with many of such cities across the world thriving economically. The reference to the thriving of port cities in Asia and Europe in the literature on account of tourism has revealed a departure from the traditional holiday havens like the Bahamas and the Paris of this world. With the implementation of smart maritime tourism suggested in this paper, a new vista of opportunity for additional income will be opening for port cities to cash in. Future research on the model raise port cities’ living standards and return on investment will be conducted.

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