

Port City Sustainability

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In recent years, with the development of society, the sustainability of port cities is increasingly valued. Port cities face huge challenges, and their sustainability needs to be better understood.

port city

sustainability

literature review

content analysis

sustainable development

1. Introduction

With the global population growth and increasingly destructive character of human activities toward the environment, sustainable development has become a global consensus. The most adopted definition of sustainability was given in the report of 'Our Common Future' for the World Commission on Environment and Development (WCED) in 1987: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" ^[1]. Sustainable development mainly includes three components: environmental sustainability, economic sustainability and social sustainability. Its connotation emphasizes the coordinated development of the environment, economy and society, and effectively combines environmental protection and human development ^{[2][3][4]}. The city itself plays a key role in sustainability, because it is not only an important engine of economic growth, but also puts tremendous pressure on the environment while facing huge challenges from society ^[5]. With the acceleration of urbanization processes, the population of the city has exploded, and the size of the city has become larger and larger. The interactions between urban environmental, social and economic issues, and urban sustainability have attracted increasing attentions ^[6].

2. Importance of Port City Sustainability

A port city is not only a center of economic activity but also an important hub of the transportation network. It combines port economy, logistics and industrial activities with the creativity of the local inhabitants ^[7]. A port city is usually the gathering point between import and export trade, and between industry and tourism. In the list of the top ten most powerful cities in the world in 2019, seven are seaport cities ^[8]. The port and the city are not two separate entities. Instead, the two identities are closely intertwined, and are mutually interdependent and influential ^[9]. Most coastal cities originated from ports, which support the development of the cities. After the Second World War, the rapid development of international trade led to the development of shipping and manufacturing in coastal areas, resulting in some large ports, which, in turn, created some large cities, such as Tokyo, Los Angeles and Singapore, etc. ^[10]. Many ports are located near urban centers or residential areas, and have become parts of urban systems ^[11]. Such a spatial intersection may bring difficulties for the construction of visually appealing urban landscapes, and may result in negative effects on people's perception of the urban environment ^[12].

Due to the comparative advantages of economies of scale and network economies which result in low transportation costs, about 90% of world-trade transportation is carried by the international shipping industry [13]. Maritime transportation has significant environmental advantages [14]. The port is a key node of the supply chain and the maritime transportation network [15], and a link between the maritime and land transportation chains [16][17]. Although they have a positive impact on increasing local employment opportunities and promoting local and regional economic growth, port activities impose a great negative impact on environmental pollution and ecological degradation [18][19]. At present, shipping has become one of the fastest growing sectors of greenhouse gas emissions [20]. Approximately 70% of the marine emissions occur in the coastal area around the world, and 60–90% of them occur while ships are berthing in ports [21]. Therefore, the reduction of the time span that a vessel spends in port can reduce emissions [22]. The production and operation activities of ports cause air pollution, noise, soil contamination, habitat destruction, and traffic congestion, etc., causing negative effects on ecosystems and the health of the local communities surrounding the ports [11][23][24][25]. As a result, there are economic and ecological conflicts between ports and the cities [7][26][27], and ports are facing increasing environmental and social pressure. Ports are closely connected with port cities, and form part of the port–city systems [28]. Due to the great impact of ports on cities, ports have become the key to the sustainable development of the entire urban system. The sustainable development of port cities requires ports to incorporate sustainability into their overall development goals and policies [9].

In recent years, as attention to the sustainability of ports and port cities is increasing, studies focused on port sustainability have gradually increased, and have appeared in some literature reviews [29][30][31][32]. As port sustainability is facing new challenges, it is important to update the literature review on the sustainability of port cities. Ports are an important source of pollution, and cities are places where people reside. While relationship between ports and cities is intricate, the sustainability of ports and port cities has increasingly aroused the worry of stakeholders such as port authorities, policy makers, users and local residents. Therefore, a timely literature review is helpful to guide the future development of this field by analyzing the research results on the sustainability of port cities published in relatively influential databases.

3. Future Prospects

We suggest that the future research on port city sustainability should follow five directions:

(1) Expanding the regional scope of the case study.

According to the latest list of the world's top 100 container ports released by Lloyd's Daily, in the UK, the top ten container ports are all in Asia, and seven of them are in China [33]. Port cities face different challenges between Europe and Asia. In Europe, due to the low interdependence and relatively stable relationships between ports and cities, the functions of ports and cities were separated earlier, and most of the waterfront areas were redeveloped because of their long history and rich cultural resources. In Asia, ports and cities have developed in a symbiotic manner, and the interdependence between ports and cities is strong, and is in a downward trend [34]. In Africa, there is huge economic potential, and great space for the development of ports and port cities. Due to the different

relationships between ports and cities among different regions, the problems faced by the sustainable development of port cities are also different. One port city can learn from another's experiences, but cannot copy them. Therefore, it will be helpful to conduct additional case studies focusing on differences in port cities between Asia, Africa and South America in the future.

(2) Enriching the assessment content for the sustainable performance (plans, policies and programs) of port cities.

There are only nine articles related to the assessment of sustainable performance (plans, policies and programs) for ports and port cities, mainly using environmental, economic and social sustainability indicators. The content of environmental assessment mostly focuses only on the impact of the port's activities and infrastructure on the natural (urban) system, but rarely involves the risk assessment. On 4 August 2020, an explosion occurred at a dangerous goods warehouse in Port Beirut, Lebanon. At least 200 people were killed, and about 5000 were injured. A large number of buildings near the port were destroyed. As many as 300,000 people were temporarily homeless, and the damage could reach \$10–15 billion ^[35]. On 12 August 2015, a large explosion occurred in a dangerous goods warehouse in Tianjin Port, China. About 173 people were killed, a large number of buildings and containers were destroyed, and economic losses of \$1.1 billion were caused ^[36]. In view of the staggering damage caused to port cities by the occurrence of port accidents, it is necessary to strengthen the risk assessment of ports and port cities in the future.

(3) Paying attention to the application of clean energy technologies in sustainable ports and port cities.

Clean energy sources, such as wind energy, solar energy, wave energy, and renewable energy are continuing to change the world. The development of clean energy technologies provides a broad prospect for the reduction of pollution in ports and port cities. Paying attention to the research and application of clean energy technologies in the sustainable development of ports and port cities is a future development trend.

(4) Promoting artificial intelligence in sustainable ports and port cities.

In recent years, artificial intelligence (AI) technology has developed rapidly, and has attracted the attention of many countries and regions for the promotion of sustainable development goals. In terms of environmental sustainability, machine learning and computational simulations can help port cities to recognize climate changes and take actions. AI can be used to monitor environmental damage, and to provide early warning of major events in ports and port cities. In terms of social sustainability, AI can excavate port cultural heritage, which is beneficial for port cities in that it allows them to promote the harmonious development of society, the economy and the environment, while protecting ports' cultural heritage.

(5) Applying landsenses ecology in sustainable ports and port cities.

There are many ports in the world which often have rich tangible and intangible cultural values due to their long history. It is of great significance for the port city system to transform the urban port landscape into a sustainable and creative hot spot while protecting the ports' cultural heritage. The strengthening of the planning of ports and

port cities is hugely important. Landsenses ecology is based on ecological principles and the analysis framework of natural elements, physical senses, psychological perceptions, socioeconomic perspectives, process–risk, and so on, and is closely linked with ecosystem services and sustainable development through landsense creation [37]. In the future, will be important to promote the application of landsenses ecology in the renewal of ports and port cities. Whilst it protects the coastal ecosystem and the historical and cultural heritage of ports, it also mobilizes people's physical and psychological perceptions, creates the port's image, stimulates the economy while meeting social needs, and realizes the regeneration and sustainable development of port cities.

References

1. World Commission on Environment and Development (WCED). Available online: <http://www.un-documents.net/wced-ocf.htm> (accessed on 15 March 2020).
2. Glavič, P.; Lukman, R. Review of sustainability terms and their definitions. *J. Clean. Prod.* 2007, 15, 1875–1885.
3. Anand, S.; Sen, A. Human development and economic sustainability. *World Dev.* 2000, 28, 2029–2049.
4. Littig, B.; Griessler, E. Social sustainability: A catchword between political pragmatism and social theory. *Int. J. Sustain. Dev.* 2005, 8, 65–79.
5. van Tuijl, E.; van den Berg, L. Annual city festivals as tools for sustainable competitiveness: The World Port Days Rotterdam. *Economies* 2016, 4, 11.
6. Zhao, J.; Zhu, Y.G.; Shao, G.; Ness, D. Coping with an urbanising world: Interdisciplinary research towards sustainability. *Int. J. Sustain. Dev. World Ecol.* 2008, 15, 284–287.
7. Karimpour, R.; Ballini, F.; Ölcner, A.I. Circular economy approach to facilitate the transition of the port cities into self-sustainable energy ports—A case study in Copenhagen-Malmö Port (CMP). *Wmu J. Marit. Aff.* 2019, 18, 225–247.
8. The Mori Memorial Foundation-Institute for Urban Strategies. Available online: <http://mori-m-foundation.or.jp/english/ius2/gpci2/index.shtml> (accessed on 10 September 2020).
9. Lam, J.S.L.; Yap, W.Y. A stakeholder perspective of port city sustainable development. *Sustainability* 2019, 11, 447.
10. Xiao, Z.; Lam, J.S.L. A systems framework for the sustainable development of a Port City: A case study of Singapore's policies. *Res. Transp. Bus. Manag.* 2017, 22, 255–262.
11. Nebot, N.; Rosa-Jiménez, C.; Ninot, R.P.; Perea-Medina, B. Challenges for the future of ports. What can be learnt from the Spanish Mediterranean ports? *Ocean Coast. Manag.* 2017, 137, 165–174.

12. Shao, J.; Qiu, Q.; Qian, Y.; Tang, L. Optimal visual perception in land-use planning and design based on landsenses ecology. *Int. J. Sustain. Dev. World Ecol.* 2020, 27, 233–239.
13. International Chamber of Shipping. Available online: <http://www.shipping-facts.com> (accessed on 25 April 2020).
14. Christodoulou, A.; Kappelin, H. Determinant factors for the development of maritime supply chains: The case of the Swedish forest industry. *Case Stud. Transp. Policy* 2020, 8, 711–720.
15. Lu, C.S.; Shang, K.C.; Lin, C.C. Examining sustainability performance at ports: Port managers' perspectives on developing sustainable supply chains. *Marit. Policy Manag.* 2016, 43, 909–927.
16. Carpenter, A.; Lozano, R.; Sammalisto, K.; Astner, L. Securing a port's future through Circular Economy: Experiences from the Port of Gavle in contributing to sustainability. *Mar. Pollut. Bull.* 2018, 128, 539–547. [PubMed]
17. Žgaljić, D.; Tijan, E.; Jugović, A.; Poletan Jugović, T. Implementation of sustainable motorways of the sea services multi-criteria analysis of a Croatian port pystem. *Sustainability* 2019, 11, 6827.
18. De Boer, W.P.; Slinger, J.H.; Vreugdenhil, H.S.; Taneja, P. Identifying ecosystem-based alternatives for the design of a seaport's marine infrastructure: The case of Tema port expansion in Ghana. *Sustainability* 2019, 11, 6633.
19. Cao, M.; Duan, X.; Zhao, X. Construction of integrated evaluation system for green port construction based on BIM technology. *J. Coast. Res.* 2019, 93, 1073–1079.
20. Winnes, H.; Styhre, L.; Fridell, E. Reducing GHG emissions from ships in port areas. *Res. Transp. Bus. Manag.* 2015, 17, 73–82.
21. Chen, J.; Huang, T.; Xie, X.; Lee, P.T.W.; Hua, C. Constructing governance framework of a green and smart port. *J. Mar. Sci. Eng.* 2019, 7, 83.
22. Kontovas, C.; Psaraftis, H.N. Reduction of emissions along the maritime intermodal container chain: Operational models and policies. *Marit. Policy Manag.* 2011, 38, 451–469.
23. Lam, J.S.L.; Notteboom, T. The greening of ports: A comparison of port management tools used by leading ports in Asia and Europe. *Transp. Rev.* 2014, 34, 169–189.
24. Puig, M.; Wooldridge, C.; Casal, J.; Darbra, R.M. Tool for the identification and assessment of Environmental Aspects in Ports (TEAP). *Ocean Coast. Manag.* 2015, 113, 8–17.
25. Lirn, T.C.; Jim Wu, Y.C.; Chen, Y.J. Green performance criteria for sustainable ports in Asia. *Int. J. Phys. Distrib. Logist. Manag.* 2013, 43, 427–451.
26. López-Navarro, M.Á.; Tortosa-Edo, V.; Llorens-Monzonís, J. Environmental management systems and local community perceptions: The case of petrochemical complexes located in ports. *Bus. Strategy Environ.* 2015, 24, 236–251.

27. Fusco Girard, L. Toward a smart sustainable development of port cities/areas: The role of the “Historic Urban Landscape” approach. *Sustainability* 2013, 5, 4329–4348.
28. Christodoulou, A.; Cullinane, K. Identifying the main opportunities and challenges from the implementation of a port energy management system: A SWOT/PESTLE analysis. *Sustainability* 2019, 11, 6046.
29. Sislian, L.; Jaegler, A.; Cariou, P. A literature review on port sustainability and ocean’s carrier network problem. *Res. Transp. Bus. Manag.* 2016, 19, 19–26.
30. Lim, S.; Pettit, S.; Abouarghoub, W.; Beresford, A. Port sustainability and performance: A systematic literature review. *Transp. Res. Part D: Transp. Environ.* 2019, 72, 47–64.
31. Özispa, N.; Arabelen, G. Sustainability issues in ports: Content analysis and review of the literature (1987–2017). *Shs Web Conf.* 2018, 58, 01022.
32. Hakam, M.H.; Solvang, W.D. Container ports sustainability-a literature review. In *Proceedings of the 2013 IEEE 4th International Conference on Cognitive Infocommunications (CogInfoCom)*, Budapest, Hungary, 2–5 December 2013; IEEE: Budapest, Hungary, 2013; pp. 803–810.
33. Lloyd’s List. Available online: <https://lloydslist.maritimeintelligence.informa.com/one-hundred-container-ports-2019> (accessed on 9 June 2020).
34. Ducruet, C. Port-city relationships in Europe and Asia. *J. Int. Logist. Trade* 2006, 4, 13–35.
35. BBC NEWS. Available online: <https://www.bbc.com/news/world-middle-east-53668493> (accessed on 9 June 2020).
36. BBC NEWS. Available online: <https://www.bbc.com/news/world-asia-china-37927158> (accessed on 15 June 2020).
37. Zhao, J.; Yan, Y.; Deng, H.; Liu, G.; Dai, L.; Tang, L.; Shi, L.; Shao, G. Remarks about landsenses ecology and ecosystem services. *Int. J. Sustain. Dev. World Ecol.* 2020, 27, 196–201.

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