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RESEARCH ARTICLE

Sustainability focused maritime studies performed in Türkiye: A literature analysis

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ABSTRACT

Sustainability-related issues have started to occupy the maritime field as well as all other fields in recent years. As elements of huge trade and industrial activities, ports and ships require considering sustainable management and development. The maritime industry has started to take steps within the framework of this requirement. In addition, researchers have been showing interest in maritime sustainability in recent years and conducting studies. This study is a review of maritime sustainability studies conducted in Türkiye. The aim is to reflect what the researchers focus mostly on maritime sustainability, and present a comparison with global studies. The included 50 studies were examined via content analysis. The scope, sustainability dimension, and focused topics of the studies were revealed. The descriptives of the studies were given. As a result, it is found to be that port-related and environmental sustainability studies are more frequent, and sustainability criteria is the most used topic.

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Introduction

Importance of Sustainability

The concept of sustainability has a quite broad meaning. It covers a way of thinking and actions that affect individuals, groups, communities, companies, and even governments, etc. Simply, it can be defined as said in the meeting of the World Commission on Environment and Development; "*to meet the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987). From this point of view, sustainability points to all the matters like efficient and fair usage of resources, pollution prevention, controlling carbon emissions and fighting climate change, etc., that relate to leaving a livable world to future generations.

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The above definitions may seem to be that the sustainability concept is only about environmental concerns, but it is not true. Sustainability has many aspects, as the United Nations declared with 17 Sustainable Development Goals like *no poverty, gender equality, clean water and sanitation, climate action,* and *peace, justice and strong institutions,* etc. (UN, 2018). Basically, sustainability or sustainable development is made of three main dimensions: *economic*, *environmental*, and *social* (Robert et al., 2005). The economic dimension is about the scarcity of resources (Kuhlman & Farrington, 2010), and the efficient and effective use of those. Environmental sustainability is the "*maintenance of natural capital*" (Goodland, 1995), which points to the correct use of the resources that the planet presents. Finally, the social dimension is good relationships and positive conditions between communities (McKenzie, 2004).

In recent decades, considerable attention has been paid to sustainability elements in also the business. Corporations in any field started preparing sustainability concerned strategies and act accordingly. Sustainability at the corporate level can be defined as meeting the demands of stakeholders, without ignoring the potential needs of future stakeholders (Dyllick & Hockerts, 2002). In this context, corporations have to satisfy their stakeholders economically, they need to establish good relations with the social environment, and while conducting business activities they have to be environmentally sensitive.

The sensitivity to sustainability issues is not only in the management and industrial meaning but also in the academic field. The quantity of research is increasing with a positive momentum day by day. Parallel to this, the context of this research is gradually expanding (Lam et al., 2014). Sustainability is a wide and complex concept, and the researchers conducted various research to identify itself and the importance of the concept in different fields.

Sustainability in Maritime Industry

Similar to other business fields, the maritime industry has been focusing on sustainability issues in recent years. This industry has a wide range of components consisting of ports and port authorities, vessels and ship-owner companies, port and ship users, seafarers and port workers, customers, etc. Processes in this kind of industry containing such a broad frame require taking sustainability seriously indeed. The policies and strategies related to maritime sustainability could be summarized as; reducing shipping distance, carbon emission and energy consumption, besides compliance with labor rights (Asgari et al., 2015). From a view of a wider range, the main subjects that the maritime industry deals with are; reducing the emissions from ports and ships, greening of ports, vessel speed optimization and fuel efficiency, renewable-clean energy usage, and regulations including MARPOL (Shin et al., 2018).

Maritime sustainability could be also separated and examined in three dimensions, as same in other fields. Economic dimension of maritime sustainability covers optimizing operations, cost reduction, and value-added services. Environmental dimension is about reducing negative impacts on nature via efficient use of resources and reducing wastes. Finally, the social dimension aims to push up the welfare of the overall society (Denktaş Şakar & Karataş Çetin, 2012).

Concerns about global warming and climate change directed researchers to examine maritime sustainability. Therefore, research in this context has increased in recent years, in parallel with other academic fields. According to the study of Shin et al. (2018), existing literature indicates that research on maritime sustainability is almost half distributed between *port-related studies* and *shipping-related studies*. Some research apart from these could be categorized under *maritime logistics* topic. With this, it was indicated in the study that research regarding maritime sustainability concentrates on a few concepts; *green ports/shipping*, *carbon emission/climate change*, and *region-specific environmental regulation/management*.

Considering maritime sustainability research on ports, some main topics could be *sustainability indicators* (Shiau & Chuang, 2015; Sislian et al., 2016; Lim et al., 2019), *green ports* (Chang & Wang, 2012; Pavlic et al., 2014), *port management* (Tezcan, 2019; Ashrafi et al., 2020), *port operations* (Kim & Chiang, 2014), etc. At the same time, research on shipping could be grouped as; *fuel efficiency* and *alternative/renewable fuels* (Mak et al., 2014; Zhao et al., 2015; Meng et al., 2016; Atilhan et al., 2021), *shipping emissions* (Bouman et al., 2017; Rehmatulla et al., 2017), *speed optimization* (Kim et al., 2014; Psaraftis & Kontovas, 2014), etc. Economic and environmental dimensions of maritime sustainability are the most examined in these studies.

Motivation and Objectives

There are some studies in the literature that are focusing on reviewing sustainability studies in maritime field. Shin et al. (2018), analyzed sustainability literature in maritime studies via text mining method. The study indicates that sustainability studies in maritime field have significantly increased since 2012. The most mentioned terms in maritime sustainability literature were; *sustainability, management, port, emissions, impact,* and *performance.* Zheng et al. (2020), performed a study

on new research trends in port city sustainability. The study is also indicating that the number of research on maritime sustainability was increased highly in recent years. The studies were categorized into five focus categories, and the most frequent category was *technologies, methods and measures to promote sustainability of port cities*. Mansouri et al.'s study (2015) shows that environmental sustainability studies in the maritime field are in a highly increasing trend in number. The study indicates that the most focused point in this research is operational improvement.

Although these reviewing studies present a broad perspective on the research on maritime sustainability literature under a global frame, a gap in studies reflecting a regional perspective has been noticed. Therefore, it is considered that a study to be carried out on the scale of Türkiye, as a study that reviews the maritime sustainability studies carried out in the regional base, will contribute to filling this gap. The objectives of this study are as follows:

(i) to present descriptive statistics of maritime sustainability studies conducted in Türkiye,

(ii) to expose the scope, sustainability dimension and focused topics of these studies,

(iii) to present an evaluation of the studies and comparison with global literature.

Material and Methods

The research process in this study was performed in two stages. In the first stage, a literature review was made to determine the studies to be included. In this study, maritime research focused on sustainability that is conducted in Türkiye was selected to review. To reach the identified sample, a literature review was performed using EBSCO, Web of Science, Scopus, ULAKBIM TR Dizin, Google Scholar, and Council of Higher Education Thesis Center databases. *Maritime sustainability, shipping sustainability,* and *port sustainability* terms and their Turkish equivalents were used as keywords while performing the search. The database searching process has been conducted in October 2022, and 69 studies were obtained. A preliminary examination was performed by reading the abstracts to determine irrelevant ones to the scope of the study. 19 of these studies were eliminated due to being out of scope. The rest 50 studies (39 articles, 8 master theses, and 3 doctoral theses) were found to be suitable for the second stage to include in qualitative content analysis.

As the literature analyses are generally a qualitative synthesis of data, the qualitative content analysis method was chosen for data analysis in this study. The qualitative content analysis examines the data gathered by means of other than measurement methods and coded and categorized (Forman & Damschroder, 2007). The analysis process can be considered into four steps: material collection, descriptive analysis, category selection, and material evaluation (Seuring & Gold, 2012). The material collection step was performed at the literature review stage. In the second step, descriptive analysis, the descriptive statistics of included studies were determined. At the category selection step, the studies were categorized under two main groups; *scope* and *sustainability dimension*. The scope group is made of three categories; *port, ship,* and *marine*, and the sustainability dimension group is also made of three categories; *economic, environmental,* and *social*. In the last step, material evaluation, the focused topics of the studies were revealed. The findings regarding these steps were detailed in the subsequent section.

Results

In the material collection step, which is the first step of content analysis, the literature review has been made and related studies were revealed. After preliminary evaluation, the studies that did not match the scope of this study completely were eliminated, and the remaining 50 studies were included in the qualitative content analysis process. In the descriptive analysis step, the type and design of the researches and publishing year were revealed in line with the first objective. Descriptives of reviewed studies are given in Table 1, Figure 1, and Figure 2.

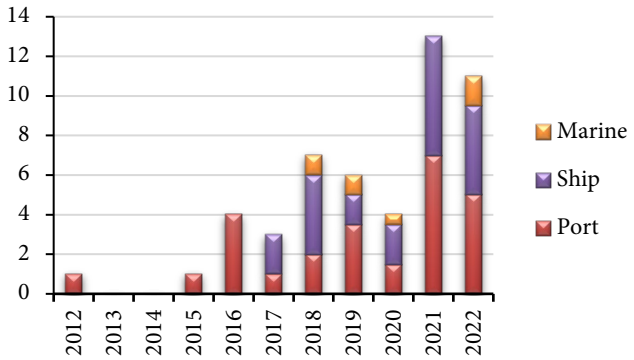

Figure 1. Annual distribution of the studies

In line with the second objective, the studies were examined in depth. Following the review of all included studies, they were categorized under two main groups the scope and dimension of sustainability. In addition, the focused topic of the studies was revealed. The findings of the category selection step are given in the Table 2, Figure 3, and Figure 4.

Table 1. Description of included studies

No	Authors	Year	Type of research	Research design
[1]	Akandere	2021	Article	Mixed
[2]	Akar et al.	2020	Article	Mixed
[3]	Akbayırlı & Tuna	2022	Article	Mixed
[4]	Baştuğ & Esmer	2022	Article	Qualitative
[5]	Bilgili	2021	Article	Mixed
[6]	Bucak	2016	Master thesis	Mixed
[7]	Bucak	2021	Doctoral thesis	Mixed
[8]	Bucak	2022	Article	Mixed
[9]	Canbulat et al.	2019	Article	Mixed
[10]	Cebeci	2017	Master thesis	Quantitative
[11]	Çağlar	2016	Article	Mixed
[12]	Çetin & Söğüt	2021	Article	Quantitative
[13]	Denktaş Şakar & Karataş Çetin	2012	Article	Qualitative
[14]	Durmaz et al.	2017	Article	Quantitative
[15]	Efecan & Gürgen	2019	Article	Qualitative
[16]	Ergin & Ergin	2018	Article	Quantitative
[17]	Fedai	2016	Master thesis	Qualitative
[18]	Gedik & Mugan-Ertuğral	2019	Article	Qualitative
[19]	Genç	2018	Article	Qualitative
[20]	Gültepe Mataracı	2016	Master thesis	Quantitative
[21]	Günaydın	2021	Master thesis	Mixed
[22]	Karakaş et al.	2021	Article	Quantitative
[23]	Karataş Çetin & Denktaş Şakar	2015	Article	Qualitative
[24]	Kaya	2022	Master thesis	Qualitative
[25]	Kılıç et al.	2020	Article	Quantitative
[26]	Büyüksaatçı Kiriş & Yılmaz Börekçi	2018	Article	Qualitative
[27]	Konur	2021	Doctoral thesis	Quantitative
[28]	Konur et al.	2022	Article	Quantitative
[29]	Korucuk & Memiş	2022	Article	Mixed
[30]	Köseoğlu & Solmaz	2020	Article	Qualitative
[31]	Özdemir	2021	Master thesis	Qualitative
[32]	Özispa	2017	Master thesis	Mixed
[33]	Özispa & Arabelen	2018	Article	Qualitative
[34]	Özispa & Arabelen	2021	Article	Quantitative
[35]	Sanrı	2021	Article	Qualitative
[36]	Sürer & Arat	2022	Article	Qualitative
[37]	Şahin et al.	2020	Article	Qualitative
[38]	Şahin et al.	2022	Article	Quantitative
[39]	Tatar & Özer	2018	Article	Qualitative
[40]	Tezcan	2019	Doctoral thesis	Mixed
[41]	Tezcan & Kuleyin	2019	Article	Mixed
[42]	Tezcan & Kuleyin	2021	Article	Mixed
[43]	Tokuşlu	2022	Article	Quantitative
[44]	Uçdu & Kılıç	2022	Article	Qualitative
[45]	Ülker et al.	2021	Article	Quantitative
[46]	Vural et al.	2021	Article	Qualitative
[47]	Yılmaz	2019	Article	Qualitative
[48]	Yigit & Acarkan	2018	Article	Quantitative
[49]	Yiğit	2018	Article	Qualitative
[50]	Yorulmaz & Patruna	2022	Article	Qualitative

Note: Source: Author

Table 2. Theme of included studies

Study	Scope			Dimension of sustainability			Focused Topic
	Port	Ship	Marine	Economical	Environmental	Social	
[1]	*			*	*		Green ports
[2]		*			*		Emissions
[3]			*	*	*	*	Alternative shipping routes
[4]	*			*		*	Sustainability criteria
[5]		*			*	*	Alternative fuels
[6]	*				*		Green ports, Sustainability criteria
[7]	*			*		*	Performance
[8]	*				*		Emissions
[9]	*	*		*	*		Emissions
[10]		*				*	Corporate social responsibility
[11]	*			*		*	Sustainability criteria
[12]		*		*	*		Energy efficiency
[13]	*			*	*	*	Stakeholder relations
[14]		*			*		Emissions, Alternative fuels
[15]		*		*	*		Alternative fuels
[16]		*		*	*		Emissions
[17]	*			*	*	*	Sustainability assessment
[18]			*		*		Marine tourism
[19]			*		*		Marine tourism
[20]	*				*		Emissions
[21]		*		*	*	*	Sustainability criteria
[22]	*				*		Emissions
[23]	*			*	*	*	Corporate social responsibility
[24]	*				*		Green ports
[25]	*	*		*	*		Energy efficiency
[26]	*			*	*	*	Sustainability criteria
[27]		*		*	*		Energy efficiency
[28]		*		*	*		Energy efficiency
[29]	*			*	*		Green ports, sustainability criteria
[30]	*				*		Green ports, sustainability criteria
[31]	*			*	*	*	Sustainability criteria
[32]	*			*	*	*	Sustainability criteria
[33]	*			*	*	*	Sustainability criteria
[34]	*			*	*	*	Sustainability criteria
[35]	*				*		Green ports
[36]		*		*	*		Alternative fuels
[37]		*	*		*		Regulations
[38]		*	*		*		Liquid wastes
[39]		*			*		Emissions
[40]	*				*		Sustainability criteria, management
[41]	*				*		Sustainability criteria, management
[42]	*				*		Sustainability criteria, management
[43]		*			*		Emissions
[44]	*			*	*	*	Green ports
[45]		*			*		Emissions
[46]		*		*	*	*	Sustainable strategies
[47]	*				*		Green ports
[48]		*		*	*		Energy efficiency
[49]		*		*	*		Alternative fuels
[50]		*		*	*	*	Green ports, management

Note: Source: Author

Figure 1 demonstrates the annual distribution of the studies. After first study has been conducted in 2012 an interruption was seen for two years. However, an increasing trend of in the number of studies is seen starting from 2015. The first studies regarding maritime sustainability were port-related. The ship-related studies were started in 2017 and the marine-related ones in 2018.

Figure 3 indicates the sustainability dimension of the studies. While some studies have a theme of containing one dimension of maritime sustainability, some of them contain two or three dimensions at the same time. Almost all studies addressed maritime sustainability in an environmental dimension (n=46, 92%). 28 studies (56%) focus on economic issues and 18 (36%) on social issues.

Figure 4 demonstrates the scope, and the sustainability dimensions mentioned per scope of the studies. The scope of most of the studies (n=27, 54%) is port-related issues. The number of ship-related studies is 22 (44%) and the marine-related studies are 5 (10%). Some of the studies focused on more than one scope. While the studies Canbulat et al. (2019) and Kılıç et al. (2020) focused on port and ship-related issues simultaneously, Şahin et al. (2020) and Şahin et al. (2022) contain ship and marine-related matters. Environmental dimension is the predominant dimension for each scope. All marine-related studies and, almost all port-related and ship-related studies are focused on environmental dimension. More than half of the port-related (59%) and ship-related (59%) studies focused on economic dimension. The number of social dimension studies in ship-related studies (n=5, 23%) is scant relatively to the port-related ones (n=12, 44%).

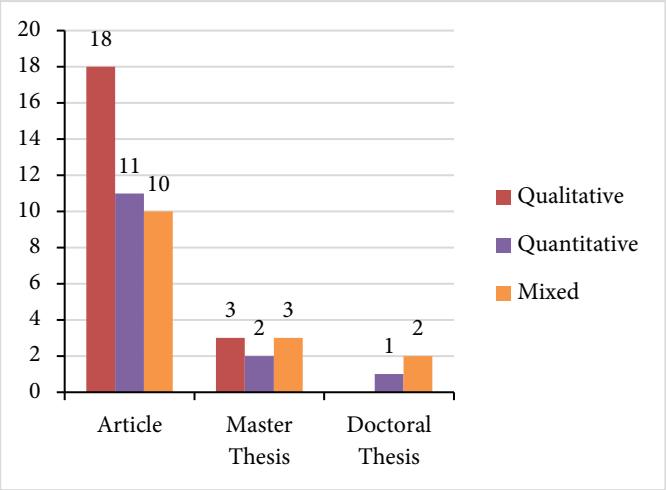

Figure 2. Research type and design of the studies

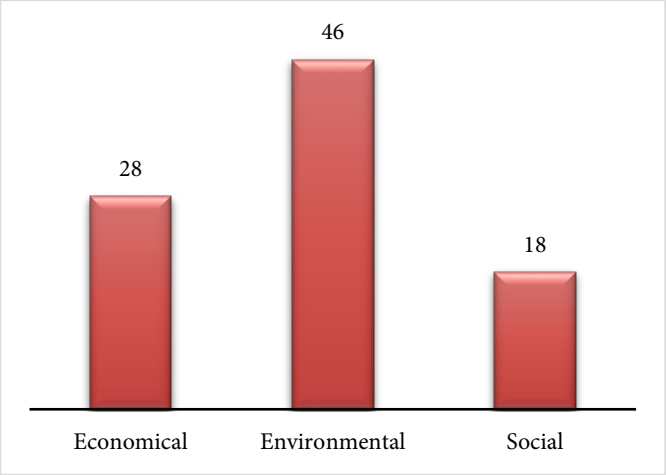

Figure 3. Sustainability dimension of the studies

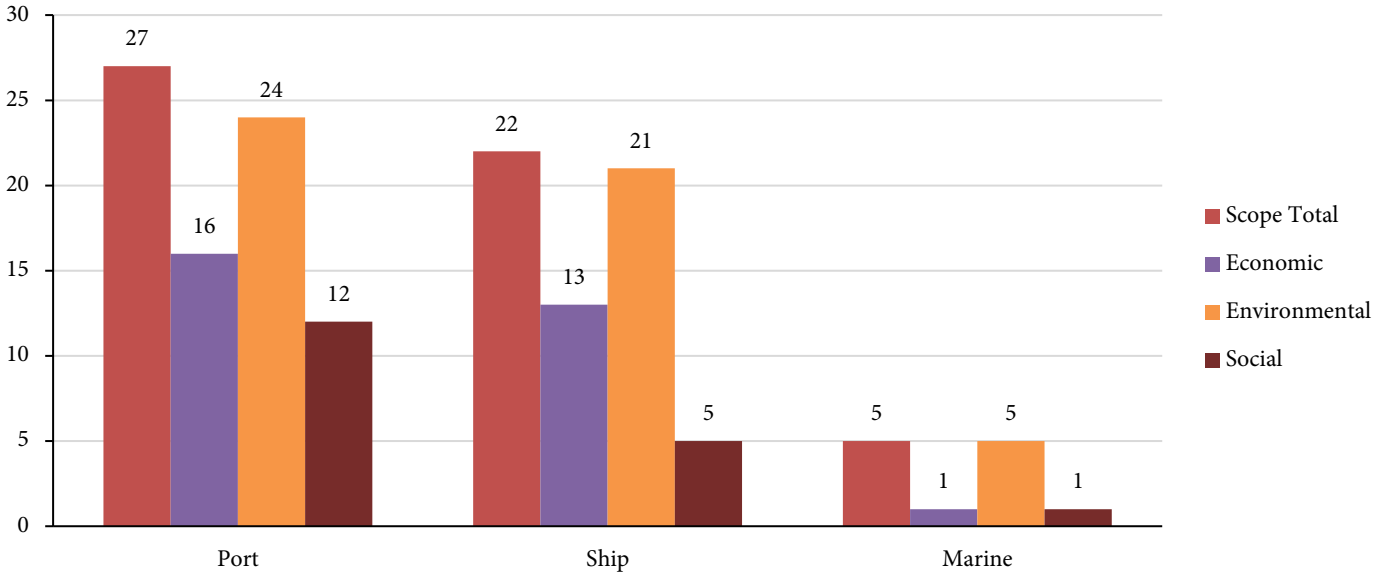

Figure 4. Dimensions per scope

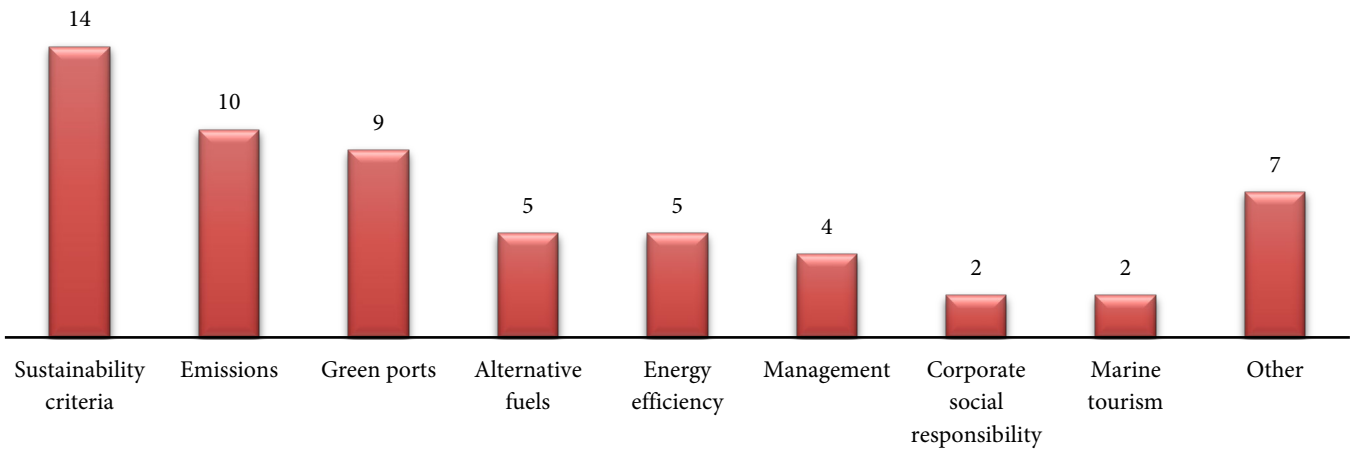

Figure 5. Focused topic of the studies

The last step of the content analysis is material evaluation. In this step, as a result of a deep examination of the studies, the focused topics were revealed. Findings related to the material evaluation step are given in Figure 5. Eight studies have focused on two different topics. The frequency of seven topics is 1, so they are grouped under a topic named *other*. The most focused topic is *sustainability criteria* (n=14, 28%). All but one of the studies focusing on this subject are within the scope of the port. Other prominent topics are *emissions* (n=10, 20%), and *green ports* (n=9, 18%). Some studies focusing on emissions topic are dealt with port emissions, while others are engaged in shipping emissions.

Discussion and Conclusion

Sustainability is a broad concept that is felt increasingly in almost all areas of life day by day. This feeling is also experienced in the maritime field, which includes huge trading and industrial activities. With this reality, researchers included in concerns about sustainability and started studying these matters. Accordingly, the number of studies on sustainability has increased considerably in recent years.

This is a review study that analyses the research performed in Türkiye on the maritime field which focuses on sustainability issues. In line with this analysis, it was desired to reveal the frequency, scope, dimension and topic of the sustainability related maritime studies performed in Türkiye. In this context, 50 studies detected in the literature were included in the analysis. According to the findings, the frequency of the studies has an increasing view in recent years. This indicates the increasing sensitivity of the researchers on sustainability issues. This finding also is in parallel with Mansouri et al. (2015); Shin et al. (2018) and Zheng et al. (2020). The number of the port-related studies is slightly more than ship-related ones as same as Shin et al. (2018). Most of the studies are articles, and the most used research design is the qualitative design. The most touched on dimension of sustainability is the environmental. Almost all studies examined environmental matters in maritime field. This could be a consequence of regulations regarding emissions reduction of IMO (International Maritime Organization) or other national-international authorities. Fuel efficiency could also be another motivation. Shin et al. (2018) found that some keywords like *emission, environmental management, carbon emission,* CO_2 *emission,* and *environmental sustainability* are frequent in maritime studies, supporting this study. In terms of the scope of the studies, it is seen that different dimensions of sustainability are mentioned in each scope. The environmental dimension is predominant for all scopes, however, the scarcity of social dimension in ship-related studies in comparison with port-related ones is quite remarkable.

The focused topic of studies was grouped under 9 main topics. The most frequent one is *sustainability criteria*. These studies determined sustainability criteria regarding effective management, performance, green ports, operations, managers, etc. The next most frequent topic is *emissions*. The studies on this topic examine control and reduction measures of both carbon and other greenhouse gas emissions. Besides, the impact of greenhouse gas emissions on the environment and maritime transportation was also studied. One of the most focused topics is *green ports*. These studies investigated the standards, criteria, and performance measurement of green ports. The green port concept is a topic of very interested in the maritime field (Zheng et al., 2020).

Consequently, the results of this study demonstrates that the maritime sustainability literature in Türkiye tends to

increase in recent years. Although global studies have started to be carried out since the 2000s, it is seen that Turkish researchers have focused on this issue mostly in the last decade. However, the frequency of scope, dimension and topics of the studies are mostly in line with global studies. The environmental dimension either in port-related or in ship-related studies is dominant, in particular. Concerns about emission reduction and energy efficiency require the continuation of work on this topic. Nevertheless, studies focusing on the social dimension are scant, especially in ship-related studies. Studies on sustainable relations between the ship and its stakeholders (ship-owner, port authorities, maritime labors, etc.) can fill the gap in this field.

Compliance With Ethical Standards

Conflict of Interest

The author declares that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

Data Availability Statements

The data that support the findings of this study are available from the author upon reasonable request.

References

Akandere, G. (2021). Evaluation of the performance of green certified ports with integrated ENTROPY-TOPSIS methods. *Hacettepe University Journal of Economics and Administrative Sciences, 39*(4), 515-535. https://doi.org/10.17065/huniibf.888903

Akar, O., Calisir, V., & Demerci, A. (2020). Determination of the amount and effects of ship fuel gas emissions in Iskenderun Bay. *Fresenius Environmental Bulletin, 7*, 6039-6045.

Akbayırlı, K., & Tuna, O. (2022). How do practitioners view Arctic shipping Routes? a cognitive appraisal approach. *Transportation Research Part D: Transport Environment, 110*, 103432. https://doi.org/10.1016/j.trd.2022.103432

Asgari, N., Hassani, A., Jones, D., & Nguye, H. H. (2015). Sustainability ranking of the UK major ports: Methodology and case study. *Transportation Research Part E: Logistics and Transportation Review, 78*, 19-39. https://doi.org/10.1016/j.tre.2015.01.014

Ashrafi, M., Walker, T. R., Magnan, G. M., Adams, M., & Acciaro, M. (2020). A review of corporate sustainability drivers in maritime ports: A multi-stakeholder perspective. *Maritime Policy & Management, 47*(8), 1027-1044. https://doi.org/10.1080/03088839.2020.1736354

Atilhan, S., Park, S., El-Halwagi, M. M., Atilhan, M., Moore, M., & Nielsen, R. B. (2021). Green hydrogen as an alternative fuel for the shipping industry. *Current Opinion in Chemical Engineering, 31*, 100668. https://doi.org/10.1016/j.coche.2020.100668

Baştuğ, S., & Esmer, S. (2022). Determinants of sustainable port competitiveness for transit container market: A systematic literature review. *İzmir Journal of Economics, 37*(1), 34-52. https://doi.org/10.24988/ije.767420

Bilgili, L. (2021). Comparative assessment of alternative marine fuels in life cycle perspective. *Renewable Sustainable Energy Reviews, 144*, 110985.

Bouman, E. A., Lindstad, E., Rialland, A. I., & Strømman, A. H. (2017). State-of-the-art technologies, measures, and potential for reducing GHG emissions from shipping–A review. *Transportation Research Part D: Transport Environment, 52*, 408-421. https://doi.org/10.1016/j.trd.2017.03.022

Bucak, U. (2016). *Green performance criteria and sustainable port concept: A comparative analysis.* [Unpublished Master Thesis. Dokuz Eylül Üniversitesi].

Bucak, U. (2021). *The components of operational performance for container terminals: A conceptual model.* [Unpublished Doctoral Thesis. Zonguldak Bülent Ecevit University].

Bucak, U. (2022). A priority analysis on emission reduction strategies in foreland and hinterland of ports. *Journal of Transportation and Logistics, 7*(1), 83-94. https://doi.org/10.26650/JTL.2022.1020557

Çağlar, V. (2016). Sustainable container terminal operations: challenges and enhancements. *Karadeniz Araştırmaları*, (49), 141-156.

Canbulat, O., Aymelek, M., Turan, O., & Boulougouris, E. (2019). An application of BBNs on the integrated energy efficiency of ship–port interface: A dry bulk shipping case. *Maritime Policy & Management, 46*(7), 845-865. https://doi.org/10.1080/03088839.2019.1634844

Cebeci, O. (2017). *Corporate social responsibility in Turkish maritime industry: A research on shipowning businesses.* [Unpublished Master Thesis. Dokuz Eylül University].

Çetin, O., & Söğüt, M. Z. (2021). A new strategic approach of energy management onboard ships supported by exergy and economic criteria: A case study of a cargo ship. *Ocean Engineering, 219*, 108137. https://doi.org/10.1016/j.oceaneng.2020.108137

Chang, C.-C., & Wang, C.-M. (2012). Evaluating the effects of green port policy: Case study of Kaohsiung harbor in Taiwan. *Transportation Research Part D: Transport Environmental Research & Technology, 17*(3), 185-189. https://doi.org/10.1016/j.trd.2011.11.006

Denktaş Şakar, G., & Karataş Çetin, Ç. (2012). Port sustainability and stakeholder management in supply chains: A framework on resource dependence theory. *The Asian Journal of Shipping and Logistics, 28*(3), 301-319. https://doi.org/10.1016/j.ajsl.2013.01.002

Durmaz, M., Kalender, S. S., & Ergin, S. (2017). Experimental study on the effects of ultra-low sulfur diesel fuel to the exhaust emissions of a ferry. *Fresenius Environmental Bulletin, 26*(10), 5833-5840.

Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business strategy and the environment, 11*(2), 130-141. https://doi.org/10.1002/bse.323

Efecan, V., & Gürgen, E. (2019). Investigation of the usability of renewable energy in maritime transportation. *Mersin University Journal of Maritime Faculty, 1*(1), 30-39.

Ergin, A., & Ergin, M. F. (2018). Reduction of ship based CO_2 emissions from container transportation. *International Journal of Computational Experimental Science and Engineering, 4*(3), 1-4. https://doi.org/10.22399/ijcesen.429944

Fedai, A. (2016). *Sustainable port management: Case study on marinas and trade ports.* [Unpublished Master Thesis. Dokuz Eylul University].

Forman, J., & Damschroder, L. (2007). Qualitative content analysis. In L. Jacoby & L. A. Siminoff (Eds.), *Empirical methods for bioethics: A primer* (pp. 39-62). Emerald Group Publishing Limited. https://doi.org/10.1016/S1479-3709(07)11003-7

Gedik, S., & Mugan-Ertuğral, S. (2019). The effects of marine tourism on water pollution. *Fresenius Environmental Bulletin, 28*, 863-866.

Genç, R. (2018). Environmental sustainability and the future of the cruise tourism: A suggested model. *Çukurova Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 22*(1), 107-114.

Goodland, R. (1995). The concept of environmental sustainability. *Annual Review of Ecology Systematics, 26*, 1-24.

Gültepe Mataracı, G. D. (2016). *Green port approach and sustainability in port authorities.* [Unpublished Master Thesis. Istanbul Teknik University].

Günaydın, S. T. (2021). *Sustainable development performance evaluation of maritime transport companies.* [Unpublished Master Thesis. Dokuz Eylül University].

Karakaş, S., Kırmızı, M., & Kocaoğlu, B. (2021). Yard block assignment, internal truck operations, and berth allocation in container terminals: introducing carbon-footprint minimisation objectives. *Maritime Economics & Logistics, 23*(4), 750-771. https://doi.org/10.1057/s41278-021-00186-7

Karataş Çetin, Ç., & Denktaş Şakar, G. (2015). Value-driven corporate social responsibility in ports. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 12*(29), 405-429.

Kaya, E. N. (2022). *Green ports for sustainable development case study: Samsunport.* [Unpublished Master Thesis. Ondokuz Mayıs University].

Kılıç, A., Yolcu, M., Kılıç, F., & Bilgili, L. (2020). Assessment of ship emissions through cold ironing method for Iskenderun Port of Turkey. *Environmental Research & Technology, 3*(4), 193-201. https://doi.org/10.35208/ert.794595

Kim, J.-G., Kim, H. J., & Lee, P. T. W. (2014). Optimizing ship speed to minimize fuel consumption. *Transportation Letters, 6*(3), 109-117. https://doi.org/10.1179/1942787514Y.0000000016

Kim, S., & Chiang, B. (2014). Sustainability practices to achieve sustainability in international port operations. *Journal of Korea Port Economic Association, 30*(3), 15-37.

Büyüksaatçı Kiriş, S., & Yılmaz Börekçi, D. (2018). Drivers and Barriers for Sustainable Port Management: A Triple Bottom Line Approach. *Istanbul Gelisim University Journal of Social Sciences, 5*(1), 192-220. https://doi.org/10.17336/igusbd.378645

Konur, O. (2021). *Application of organic Rankine cycle (ORC) system to marine vessels.* [Unpublished Doctoral Thesis. Dokuz Eylül University].

Konur, O., Yuksel, O., Korkmaz, S. A., Colpan, C. O., Saatcioglu, O. Y., & Muslu, I. (2022). Thermal design and analysis of an organic Rankine cycle system utilizing the main engine and cargo oil pump turbine based waste heats in a large tanker ship. *Journal of Cleaner Production, 368*, 133230. https://doi.org/10.1016/j.jclepro.2022.133230

Korucuk, S., & Memiş, S. (2019). Prioritization of green port applications performance criteria with DEMATEL method: Case of Istanbul province. *Avrasya Uluslararası Araştırmalar Dergisi, 7*(16), 134-148. https://doi.org/10.33692/avrasyad.543735

Köseoğlu, M. C., & Solmaz, M. S. (2020). A comparative evaluation of Turkey's and the World's green port criteria. *Dokuz Eylul University Maritime Faculty Journal, 12*, 33-58. https://doi.org/10.18613/deudfd.803386

Kuhlman, T., & Farrington, J. (2010). What is sustainability? *Sustainability, 2*(11), 3436-3448. https://doi.org/10.3390/su2113436

Lam, J. C., Walker, R. M., & Hills, P. (2014). Interdisciplinarity in sustainability studies: A review. *Sustainable Development, 22*(3), 158-176. https://doi.org/10.1002/sd.533

Lim, S., Pettit, S., Abouarghoub, W., & Beresford, A. (2019). Port sustainability and performance: A systematic literature review. *Transportation Research Part D: Transport & Environment, 72*, 47-64. https://doi.org/10.1016/j.trd.2019.04.009

Mak, L., Sullivan, M., Kuczora, A., & Millan, J. (2014). *Ship performance monitoring and analysis to improve fuel efficiency. Proceedings of the 2014 Oceans - St. John's*, St. John's, NL, Canada. pp. 1-10. https://doi.org/10.1109/OCEANS.2014.7003300

Mansouri, S. A., Lee, H., & Aluko, O. (2015). Multi-objective decision support to enhance environmental sustainability in maritime shipping: A review and future directions. *Transportation Research Part E: Logistics Transportation Review, 78*, 3-18. https://doi.org/10.1016/j.tre.2015.01.012

McKenzie, S. (2004). Social sustainability: Towards some definitions. *Hawke Research Institute Working Paper Series*, No 27. Retrieved on January 5, 2023, from https://www.unisa.edu.au/siteassets/episerver-6-files/documents/eass/hri/working-papers/wp27.pdf

Meng, Q., Du, Y., & Wang, Y. (2016). Shipping log data based container ship fuel efficiency modeling. *Transportation Research Part B: Methodological, 83*, 207-229. https://doi.org/10.1016/j.trb.2015.11.007

Özdemir, Y. (2021). *An exploratory research on implementing sustainable development goals in container ports.* [Unpublished Master Thesis. Bahçeşehir University].

Özispa, N. (2017). *Sustainability performance measurement in ports by using AHP and TOPSIS methodology.* [Unpublished Master Thesis. Dokuz Eylül University].

Özispa, N., & Arabelen, G. (2018). Assessment of port sustainability indicators in the sustainability reporting process. *Beykoz Akademi Dergisi, 6*(1), 1-28.

Özispa, N., & Arabelen, G. (2021). Prioritizing the sustainability strategies of ports via AHP approach. *Journal of Yasar University, 16*(63), 1430-1453.

Pavlic, B., Cepak, F., Sucic, B., Peckaj, M., & Kandus, B. (2014). Sustainable port infrastructure, practical implementation of the green port concept. *Thermal Science, 18*(3), 935-948.

Psaraftis, H. N., & Kontovas, C. A. (2014). Ship speed optimization: Concepts, models and combined speed-routing scenarios. *Transportation Research Part C: Emerging Technologies, 44*, 52-69. https://doi.org/10.1016/j.trc.2014.03.001

Rehmatulla, N., Calleya, J., & Smith, T. (2017). The implementation of technical energy efficiency and CO_2 emission reduction measures in shipping. *Ocean Engineering, 139*, 184-197. https://doi.org/10.1016/j.oceaneng.2017.04.029

Robert, K. W., Parris, T. M., & Leiserowitz, A. A. (2005). What is sustainable development? Goals, indicators, values, and practice. *Environment: science and policy for sustainable development, 47*(3), 8-21. https://doi.org/10.1080/00139157.2005.10524444

Şahin, V., Bilgili, L., & Vardar, N. (2020). An examination of focus progress of studies on Marpol Annex IV and Annex VI: A review. *Dokuz Eylül Üniversitesi Denizcilik Fakültesi Dergisi, 12*(1), 47-64. https://doi.org/10.18613/deudfd.775129

Şahin, V., Bilgili, L., & Vardar, N. (2022). Estimation of dilution factor for moving cruise ships by artificial neural networks. *Water, Air, & Soil Pollution, 233*(7), 235. https://doi.org/10.1007/s11270-022-05701-x

Sanrı, Ö. (2021). A content analysis of green port, 2009-2020. *Beykoz Akademi Dergisi, 9*(2), 50-72.

Seuring, S., & Gold, S. (2012). Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management, 17*(5), 544-555. https://doi.org/10.1108/13598541211258609

Shiau, T.-A., & Chuang, C.-C. (2015). Social construction of port sustainability indicators: A case study of Keelung Port. *Maritime Policy & Management, 42*(1), 26-42. https://doi.org/10.1080/03088839.2013.863436

Shin, S.-H., Kwon, O. K., Ruan, X., Chhetri, P., Lee, P. T.-W., & Shahparvari, S. (2018). Analyzing sustainability literature in maritime studies with text mining. *Sustainability, 10*(10), 3522. https://doi.org/10.3390/su10103522

Sislian, L., Jaegler, A., & Cariou, P. (2016). A literature review on port sustainability and ocean's carrier network problem. *Research in Transportation Business & Management, 19*, 19-26. https://doi.org/10.1016/j.rtbm.2016.03.005

Sürer, M. G., & Arat, H. T. (2022). Advancements and current technologies on hydrogen fuel cell applications for marine vehicles. *International Journal of Hydrogen Energy, 47*(45), 19865-19875. https://doi.org/10.1016/j.ijhydene.2021.12.251

Tatar, V., & Özer, M. B. (2018). The impacts of CO_2 emissions from maritime transport on the environment and climate change. *International Journal of Environmental Trends, 2*(1), 5-24.

Tezcan, Ö. (2019). *Evaluating port managers' primary competencies in terms of port's sustainability performance.* [Unpublished Doctoral Thesis. Dokuz Eylul University].

Tezcan, Ö., & Kuleyin, B. (2019). Academicians viewpoint on port managers prior competencies in terms of environmental sustainability performance of container port enterprises in Turkey. *Journal of ETA Maritime Science, 7*(4), 280-292. https://doi.org/10.5505/jems.2019.29491

Tezcan, Ö., & Kuleyin, B. (2021). Evaluating port operation managers' competencies related to the port environmental sustainability performance. *Pomorstvo, 35*(1), 141-149. https://doi.org/10.31217/p.35.1.15

Tokuşlu, A. (2022). Analysing shipping emissions of Turkish ports in the Black Sea and investigating their contributions to Black Sea emissions. *International Journal of Environment and Geoinformatics, 9*(3), 14-20. https://doi.org/10.30897/ijegeo.912837

Uçdu, G., & Kılıç, A. (2022). Investigation of Turkish ports within the scope of port location selection and green port. *Deniz Taşımacılığı ve Lojistiği Dergisi, 3*(1), 35-49. https://doi.org/10.52602/mtl.1037262

Ülker, D., Bayırhan, İ., Mersin, K., & Gazioğlu, C. (2021). A comparative CO_2 emissions analysis and mitigation strategies of short-sea shipping and road transport in the Marmara Region. *Carbon Management, 12*(1), 1-12. https://doi.org/10.1080/17583004.2020.1852853

UN. (2018). Sustainability guide. *UN Sustainable Development Goals.* Retrieved on September 5, 2019, from https://sustainabilityguide.eu/sustainability/un-sustainable-development-goals/

Vural, C. A., Baştuğ, S., & Gülmez, S. (2021). Sustainable brand positioning by container shipping firms: Evidence from social media communications. *Transportation Research Part D: Transport & Environment, 97*, 102938. https://doi.org/10.1016/j.trd.2021.102938

WCED (World Commission on Environment and Development). (1987). *Our common future.* Oxford University Press.

Yiğit, K. (2018). *Gemi teknolojisinde alternatif enerji sistemlerinin kullanım potansiyelinin incelenmesi* [An examination of the potential usage of alternative energy systems in ship technology]. *GMO Journal of Ship and Marine Technology*, *214*, 5-18.

Yigit, K., & Acarkan, B. (2018). A new electrical energy management approach for ships using mixed energy sources to ensure sustainable port cities. *Sustainable Cities and Society, 40*, 126-135. https://doi.org/10.1016/j.scs.2018.04.004

Yılmaz, F. (2019). "*Yeşil-Eko Liman Yaklaşımı"nın deniz ticareti ve lojistik sektörüne katkıları: Türkiye ve AB'deki uygulamaların karşılaştırması* [Contributions of "Green-Ecoport Approach" to merchant trade and logistics: comparison of practices in Turkey and the European Union (EU). *Journal of Transportation and Logistics, 4*(2), 65-78. https://doi.org/10.26650/JTL.2019.04.02.02

Yorulmaz, M., & Patruna, E. (2022). *Sürdürülebilir yeşil liman algisinin ve yönetiminin değerlendirilmesi* [Evaluation of sustainable green port perception and management]. *International Journal of Afro-Eurasian Research, 7*(13), 148-168.

Zhao, F., Yang, W., Tan, W. W., Chou, S. K., & Yu, W. (2015). An overall ship propulsion model for fuel efficiency study. *Energy Procedia, 75*, 813-818. https://doi.org/10.1016/j.egypro.2015.07.139

Zheng, Y., Zhao, J., & Shao, G. (2020). Port city sustainability: a review of its research trends. *Sustainability, 12*(20), 8355. https://doi.org/10.3390/su12208355