Chapter 5
Towards Decarbonized Port Management:
Systematic Review

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ABSTRACT

The contribution of port operational activities to climate change has made it a research focus of increasing concern. To identify the news and characteristics of research on carbon emissions in the maritime transport sector, this study used the "Scopus" and "Web of Science" databases for the period 2020-2024. In addition, we identify the contributions of the most cited review articles. The results of the analysis highlight that port carbon emission reduction strategies involve operational optimization, equipment transformation and energy management and that the inherent gaps between ports present challenges in establishing a standard methodology at the global level. Future research avenues have been suggested, such as comprehensive assessment of emission sources, harmonization of estimation methods, equipment-integrated planning, port automation and electrification, and energy management. This study guides the progress of port carbon emission assessment and reduction, thus enabling port operators to manage production efficiently.

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INTRODUCTION

The needs of international trade have led to a rapid and significant development of maritime transport in recent years. This development has prompted ports and terminals to improve their operations in order to become more efficient, more competitive and more sustainable.(Okşaş, 2023). Due to the increased capacity of ports and the volume of cargo they handle, sustainability has become even more crucial. In this regard, the link between port performance and sustainability needs to be explained more clearly. Nowadays, the environmental impact of a port is one of the most crucial aspects of its sustainability. Ports, which are one of the main cornerstones of the maritime sector, are responsible for a disproportionate share of the environmental damage caused by maritime trade and operations.(Bensfia, 2025; Bensfia & Aidi, 2025; Okşaş, 2023).

For port regions, the negative environmental effects of climate change provide significant obstacles. Three per cent of the world's greenhouse gas emissions from marine transportation come from ports.(Barkley et al., 2017; Misra et al., 2017; L. Wang & Li, 2023). According to the International Association of Ports and Harbors (IAPH), greenhouse gas emissions from ports are responsible for environmental pollution and global warming (IAPH, 2010). Ports mainly generate greenhouse gases such as carbon dioxide (CO2), nitrogen dioxide (N2O) and methane (CH4) during their daily operations.(Yang, 2017), One of the main contributors to the potential for global warming is CO2(Styhre et al., 2017; L. Wang & Li, 2023).According to Wright, As vital hubs in the global supply chain, ports are vital to a nation's external growth (Wright, 2013). This is why experts are interested in how carbon dioxide emissions affect the atmosphere. There's no denying the importance to mankind of CO2 emissions from port operations. Carbon emissions from ports have a negative impact on local air, water and soil quality, as well as on the quality of life of local residents (Eyring et al., 2010). One of these impacts is the propensity of CO2 emissions to increase temperature degrees (Wang et al., 2023).

CO2 emissions have adverse effects on human health and national economies, in addition to their direct impact on the environment (Wang et al., 2023). Extreme temperatures, pollution of the air, decreased agriculture, rising sea levels, and other significant global problems are some of these effects, according to Du et al. (Wang et al., 2023). All of these issues have the potential to immediately jeopardise human life if they are not addressed. Therefore, one of the most important aspects of encouraging sustainable socioeconomic growth at ports is lowering these environmental issues (IPCC, 2013, L. Wang & Li, 2023).

However, a thorough examination of carbon emissions in port regions is necessary for the literature now in publication (Wang et al., 2023). A more thorough investigation of carbon emissions from ports is necessary given the substantial influ-

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Marcelo Rodrigues dos Anjosand Marla Schulz (2011). *International Journal of Social Ecology and Sustainable Development (pp. 66-76).*
www.irma-international.org/article/investigation-deforestation-environmental-protection-areas/61384