
Environmental Management in a Seaport in the Context of Sustainable Development Challenges

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Abstract:

Purpose: The primary objective of the scientific article is to identify the potential threats resulting from the implementation of the concept of sustainable development in seaports.

Methodology: A few research methods and techniques were applied: critical literature review, research questionnaire, comparative analysis and case study.

Findings: Environmental management as part of the concept of sustainable development influences the management of seaports, which, among other things, is the result of pro-environmental demands made by various stakeholders. However, the concept faces a number of barriers that can delay the achievement of set goals, including pro-environmental ones.

Practical implications: A key factor that can negatively affect the scope and pace of implementation of sustainable environmental solutions in seaports are the many barriers that the concept may encounter. Knowledge of existing barriers can reduce their strength and positively influence the scope of environmental management in seaports.

Originality: This research is an attempt to determine the specificity of environmental management in a seaport, taking into account the difficulties that may arise in achieving sustainable development goals.

Keywords: Environmental management, port environmental management, sustainable development in seaports.

JEL classification: D78, Q01.

Paper type: Research paper.

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1. Introduction

Currently, one of the most significant problems associated with economic activity is the progressive degradation of the surrounding environment. It is well known that the phenomena associated with the imbalance between human activity and activity and the environment are not new and have accompanied civilization since the dawn of time. However, the dynamic development of technology and the population explosion that took place at the end of the 19th century have intensified the impact of adverse factors on the environment. The climate situation calls for rapid large-scale action to slow the process of global warming.

The aforementioned issues do not bypass seaports. Their location at the interface between land and sea gives ports a unique business character that can shape their role, including in social terms (Olivier *et al.*, 2016; Lee *et al.*, 2016; Klimek *et al.*, 2020). To reduce the negative results of port operations, ecology and sustainability have recently become particularly important in maritime transportation. This is also the result of legal requirements from international regulatory bodies such as the IMO or the European Union, as well as influenced by external pressures from industry stakeholders, among others (Puig *et al.*, 2022). In order to achieve the aforementioned goals (Skiba, 2013a), it is necessary to make decisions that fit into the rules of environmental management.

In the context of seaport operations and activities, environmental management is defined as the functional organization necessary to ensure environmental protection and sustainability with the highest standards of quality and accountability (Barrow, 2006; Skiba, 2013b). In recent years, port authorities have come under clear pressure from a growing group of stakeholders to not only ensure compliance with the standards being introduced, but also to achieve ever higher standards of environmental care in their operations and provide evidence of their increasing environmental performance (Espo, 2020).

2. Assumptions of Sustainable Development

The term “sustainable development” was first mentioned in the report “Our Common Future” by the Brundtland Commission, the World Commission on Environment and Development, formally institutionalized as a sub-organization of the United Nations. It was described as “meeting the needs of the present generation without compromising the future generation's ability to meet their needs” (United Nations, 1987).

In the next steps, several efforts were put forward to establish sustainability measures in different economic layers, and one of the significant steps is Agenda 21 and Millennium Development Goals (MDGs). This aggregation of endeavours of different organizations and countries emerged as the latest 2030 Agenda for Sustainable Development in 2015 (United Nations Conference on Trade and

Development, 2015). In total, 17 Sustainable Development Goals (SDGs) and 169 targets were introduced in the agenda by providing a broad interpretation to the word “sustainability”. The 17 goals are indivisible and encompassing three dimensions of sustainability.

The essence of sustainable development is to strive for a balance between three main dimensions: economic, social and environmental. The main goal is to meet the needs of current generations without compromising the ability of future generations to meet their needs. Figure 1 shows the main areas of sustainable development.

Figure 1. Sustainable development goals (e-globalna.edu.pl/index.php?etap=10&i=97).



Source: Own study.

According to the assumptions, the goals of sustainable development have been classified into three dimensions:

Economic dimension: It includes the pursuit of economic growth, job creation and efficient management of resources. It is important that economic development is sustainable and does not lead to environmental degradation.

Social dimension: It focuses on improving the quality of life of people, social equality, access to education, health and other basic services. It is important to build communities that are resilient to change and conflict.

Environmental dimension: It concerns the protection of ecosystems, biodiversity and natural resources. Sustainable development requires responsible management of these resources to prevent their depletion and degradation.

All UN member states pledged on common agenda for sustainability (The United Nations, 2015). Several international efforts were made towards SDGs in terms of capacity building, knowledge management, agency level coordination, stakeholder engagement and active communication within the society (Fleming *et al.*, 2017).

The Intergovernmental Panel on Climate Change (IPCC) embarked on achieving net zero economy by 2050 and urged governments to facilitate industries to implement decarbonization strategies. OECD (2021) highlighted the role of governments and industrial policies and business organizations in designing and implementing strategies contributing to the SDGs. Similarly, the UN specified finance, technology, capacity building, trade, policy coherence, partnerships, data monitoring and accountability as the key means of SDG implementation (Stafford-Smith *et al.*, 2017; Katuwawala *et al.*, 2022).

International Maritime Organization (IMO) has been emphasizing the importance of the shipping industry in achieving all SDGs by revealing its leading role in promoting worldwide trade and supporting global economic growth (Sciberras *et al.*, 2018). The port sector has a unique role in fostering sustainability. There are numerous stops at ports along the way for ships all around the world. The point where global trade and economy have reached today means we rely on ships and ports to transport goods. Given their unique position in the shipping supply chain between different transportation modes, seaports are economic engines and gateways to trade (Hossain *et al.*, 2019).

This dependence and reliance on global shipping increase both the contribution and the externalities of the industry to sustainability on a local and global scale (Skiba, 2019). Firstly, despite their economic importance, ports adversely impact the environment. The port industry is one of the fastest growing sectors causing environmental pollution (UNCTAD, 2020).

Secondly, some specifications such as the intensity of the workforce, contribution to economic growth, the connection, and relationship with cities yield a different degree in social and economic sustainability compared to other industries. Society increasingly expects ports to balance economic growth with social and environmental effects.

Because the domain of a port economy is quite broad, it includes environmental management, land usage, emission and wastage management, energy resources, human resources, natural life, transportation and connections, education and knowledge sharing, local impacts, and port-city integration (Caliskan, 2022).

Therefore, parallel with stakeholder theory (Freeman *et al.*, 1983), ports have enormous potential to create value for their owners and multiple industries, groups, actors, and individuals (Caliskan, 2022).

The assumptions of sustainable development in seaports include a number of actions and policies that aim to minimize the negative impact of port activities on the environment, society and economy. Here are the key assumptions:

- Environmental protection: Implementing practices that reduce air, water and soil pollution, such as waste management, reducing CO2 emissions and using environmentally friendly technologies.
- Energy efficiency: Promoting the use of renewable energy sources and optimizing energy consumption in port processes, which allows for a reduced carbon footprint.
- Resource management: Sustainable management of natural resources, such as water and raw materials, to ensure their long-term availability.
- Social responsibility: Supporting local communities by creating jobs, involving residents in decision-making processes and promoting social equality.
- Safety and health: Ensuring occupational safety and health protection for workers and residents in port areas through appropriate regulations and practices.
- Sustainable transport: Promoting intermodal transport that combines different modes of transport and developing infrastructure that supports the use of public transport and cycling.
- Technological innovation: Implementing modern technologies that increase the operational efficiency of ports while minimizing the impact on the environment.
- Education and awareness: Promoting environmental awareness among port employees and local communities, as well as cooperation with scientific and educational institutions.
- Spatial planning: Developing port development strategies that take into account both economic needs and environmental protection and social well-being.
- International cooperation: Participating in global initiatives and standards on sustainable development in maritime transport, such as those promoted by (IMO).

3. Barriers to Sustainable Development in Seaports - Research

The article uses a mixed research method. The first stage of the research consisted of a review of the literature in the field of sustainable development, taking into account the specificity of activities in this field within the activities of specific business entities such as seaports. The second stage of the research consisted of conducting face-to-face interviews with management representatives of selected ports.

The aforementioned interviews were conducted with management staff representatives of the largest seaports in Poland, namely, the port of Gdansk, Gdynia and Szczecin-Świnoujście. The aim of the second stage of the research was to identify barriers to implementing the concept of sustainable development in individual seaports, as perceived by port managers in Poland.

In turn, the third stage of the research consisted of contacting survey respondents from the second stage of the research again, but this time the research was intended to lead to a hierarchy of barriers that had been identified in earlier surveys. Thanks to this research, it was possible to organize the barriers according to the criterion adopted, which was the impact on the emergence of difficulties in implementing the assumptions of sustainable development in seaports.

Originally, the hierarchy of the aforementioned barriers was to have a full division, that is, from the most significant to the least significant factors. However, due to the large number of barriers indicated in the second stage of the research, in the third stage of the research the respondents had difficulty in determining the exact hierarchy. Therefore, it was decided to abandon the full hierarchy in favor of dividing the barriers into three groups in terms of importance. On this basis, it was possible to divide barriers into those of most importance, those of moderate importance and those of low importance.

There are many benefits to implementing sustainability in seaports, but also some risks. Respondents in face-to-face interviews identified the following barriers in the second stage of the research:

B1. Insufficient level of cooperation: Different stakeholder groups, such as shipowners, local communities, environmental organizations or port authorities, may have conflicting goals, leading to tensions and conflicts.

B2. Lack of flexibility to change existing business models: The increasing volatility of the environment forces the need for a more flexible approach to changes in the conduct of business activities.

B3. Financial costs: Investments in sustainable technologies, such as waste management systems or renewable energy sources, can be costly and difficult to finance, which can affect the port's profitability.

B4. Power of labor unions: Labor organizations may take a negative view of proposed changes if they violate existing labor rights.

B5. Regulatory changes: Implementing sustainable development may require compliance with new regulations and standards, resulting in additional costs and administrative difficulties.

B6. Outdated legislation: Local regulations may not keep up with current international regulations.

B7. Operational constraints: New environmental procedures may affect the operational efficiency of ports, which may lead to delays and increased costs for carriers.

B8. Environmental risk management: Implementing sustainable practices requires effective environmental risk management, which can be complex and require specialized knowledge.

B9. Lack of knowledge and experience: Ports may lack sufficient experience in implementing sustainable solutions, which can lead to inefficiencies.

B10. Insufficient knowledge of the desirability of the measures taken: Employees may not be convinced by the changes made, resistance to change.

B11. Fragmented public policy framework for sustainable development: Lack of a substantive coherent plan for implementing subsequent solutions.

B12. Limited natural resources: Implementing sustainable development practices may require access to limited natural resources, which may lead to further exploitation or conflicts over their use.

B13. Lack of a framework for sustainable port development: This can lead to inconsistent actions and the consequent dilution of originally set goals.

B14. Lack of central directive authority: Any change requires proper control to improve the process of managing that change. The lack of a central controlling authority in the aspect in question may result in inefficiency in the actions taken.

B15. Negative impact on local communities: Changes related to the implementation of sustainable development may affect employment and local economies, which may lead to resistance from communities.

From the interviews conducted in the second stage, it can be concluded that port managers in Poland presented numerous barriers to the implementation of sustainable development in seaports. The barriers mentioned were related to various aspects, legal, organizational, social, as well as it was indicated that the barriers that arose were due to limitations in port resources. This includes limited property, human, financial, as well as information resources. The barriers mentioned were concentrated in both intra-port and external dimensions, i.e., independent of the seaport's activities.

Stage three of the research made it possible to divide the barriers listed in stage two into three homogeneous groups. Table 1 shows the results of the study.

Table 1. *Hierarchy of importance of barriers to the implementation of the concept of sustainable development in seaports in Poland.*

Level of importance		
Essential	Moderate	Limited
B1	B2	B4
B3	B8	B6
B5	B9	B10
B7	B11	B14
B13	B12	B15

Source: Own elaboration.

Port managers in Poland indicated that the most significant barriers to implementing sustainability include insufficient cooperation between the various stakeholders in the process (B1), which can translate into another barrier, namely an increase in the cost of doing business (B3). The legal aspect (B5) is also considered to be part of the core group of barriers, as is the lack of a vision for sustainable port development (B13) and operational constraints of the port (B7), which can lead to an increase in the cost of port operations and thus a reduction in the level of competitiveness.

Seaport managers in Poland, on the other hand, included ossified business structures with limited willingness to embrace change (B2) and the risks associated with it in the group of moderate barriers. Lack of knowledge and experience (B9) and, by extension, limited competence to manage environmental risks (B8) were other barriers ranked as moderate. Likewise, a fragmented public policy framework for sustainable development (B11) and limited natural resources used to implement new solutions (B12) were included in the same group of barriers.

The last group of barriers, namely of limited importance, includes resistance by labor unions and local communities to implementing solutions that promote sustainability (B4, B10, B15), as well as delays in aligning local laws with international regulations (B6). The lack of a central directive body to control the implementation of adopted solutions was also considered a barrier by respondents, but of limited importance.

4. Conclusions and Recommendations

The introduction of integrated environmental management strategies that take into account environmental, economic and social aspects is essential to achieving sustainable port development. Involving local communities in environmental management decision-making processes can further increase acceptance of port operations and promote sustainability. Sustainable development requires long-term planning and investment that will benefit both current and future generations.

Effective environmental management at seaports not only promotes the protection of ecosystems, but also contributes to operational efficiency, port competitiveness and the quality of life of local communities.

Port managers perceive numerous threats that can negate the potential positive effects of environmental actions taken. The article undertook a study that made it possible to identify the mentioned barriers. The research was conducted on the example of selected ports in Poland. The results made it possible to identify fifteen barriers indicated by representatives of management. In the next step, the identified barriers were divided into three groups of a relatively homogeneous nature.

Knowledge of the existing barriers can prove useful knowledge for port managers to reduce unnecessary practices and maximize the results of pro-environmental measures taken.

There are some limitations of the study conducted, which may be the focus of further research in this area. These limitations relate to the size of the sample, the scope of the research conducted and the use of statistical tools.

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