


# Adoption of Sustainability in Seaport Infrastructure: A Systematic Literature Review

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## ABSTRACT

The objective of the research is to analyse the sustainability measures that can be undertaken in the seaport infrastructures. The study is based on systematic literature review. The scope of the research is qualitative and may serve as a basis for identifying factors that can contribute to the adoption of sustainability in the seaport infrastructure sector. The article has direct implications for seaport infrastructure providers. They are encouraged to regularly monitor and to build climate resilient seaport (hereafter 'port') infrastructure as it is crucial for the economic growth of many developing and emerging countries, as the majority of global trade is done through sea mode. The article collates and examines recent seaport infrastructure study findings. It presents a comprehensive, conceptual model encompassing research work and a holistic view of various aspects affecting sustainability of seaport infrastructure. The article develops a conceptual model that needs to be confirmed empirically.

## KEYWORDS

international Developmental Financial Institutions (iDFIs), Nature Based Solutions, Public Private Partnership (PPP), Risk-Return Matrix, UNSDGs, Sustainable Gap Funding

## 1. INTRODUCTION

Sustainability means enduring far into the future, and it refers to systems and processes that are able to operate and persist on their own over long periods of time (Robertson, 2021).

According to the American Association of Port Authorities (AAPA), port sustainability is defined as strategies and activities that meet current and future needs of port stakeholders while protecting and sustaining human and natural resources. Although ports contribute to the economic development of the region, they also impact the environment and thereby have an adverse impact on local communities.

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Therefore, sustainable initiatives during the development of port infrastructure and port operations are being emphasised. Sustainability considers social, economic and environmental issues, whereas green is solely focused on environmental issues (Ashrafi et al., 2019, 2020).

The purpose of this study is to understand sustainability elements and the measures that can be undertaken with the active participation of all stakeholders to improve the adoption of sustainability in port infrastructure. The study primarily explores the way various sustainable parameters can be included during the project planning and design stages of the development of port infrastructure.

## **2. LITERATURE REVIEW**

The topic of sustainability and its applications in various industries has gained importance in the last decade. Sustainability in the seaport sector has also attracted attention among researchers. There are numerous literatures on sustainability issues and the importance of sustainability in the seaport structure. The articles were collated with a search through keywords and reviewed. The initial inference drawn from the articles were that:

- Sustainability adoption is an important consideration of all countries following the UN guidelines of 17 Sustainability Goals.
- Building seaport infrastructure is crucial to trade and commerce.
- Emerging economies, particularly in Asia, are focusing largely on building port infrastructure to promote trade.
- In building port infrastructure, the need for sustainability inclusion is gaining importance to preserve the fragile ecosystem.
- There are challenges in adopting sustainable parameters while developing such infrastructure.
- The role of key stakeholders is crucial in sustainability adoption.

Most literature on the subject highlights either the environmental or the social issues encountered in the seaports. Research on economic issues mostly centres around the analysis of funding for creating seaport infrastructures. There are also numerous research articles on the operational aspect of seaport management and linkages with sustainability dimensions through case study approaches. All these studies contributed to identifying key areas that are pertinent in the adoption of sustainability in seaport infrastructure.

### **2.1 Seaport Infrastructure Overview**

Ports are crucial infrastructures that facilitate trade and commerce. The three stages in port development are the planning stage, the construction stage and the implementation stage. During the project planning stage, the roles of engineers and design experts are crucial. In the construction stage, project developers, financiers and local population are the key players. During the project implementation stage, key stakeholders are the port authorities, concessionaire (in case of a public-private partnership set up), financiers and the project implementing agencies.

### **2.2 Sustainability of Seaport Infrastructure**

The port industry faces increasing challenges in addressing societal and environmental considerations while at the same time having to provide adequate capacity and cost-effective services to traders and associated industry clusters (Haezendonck & Langenus, 2019). These challenges stimulated the development of concepts such as ‘green ports’ with the key objectives of balancing environmental challenges and economic demand (Bergqvist & Monios, 2019) and striving to establish sustainable ports by increasing both their economic and environmental competitiveness. With increasing socio-

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