



Sustainable ports underpin the green transition

The importance of protecting the natural environment and resources for human existence and development is considered a fundamental approach towards sustainability. There are several port-related issues with sustainability implications, such as energy savings, air quality, emission reduction, natural resources conservation, and waste handling which are already being considered by the industry. A number of initiatives to address these are now in place, including sustainable ports, eco-ports, and green ports. Invariably, the goal is to achieve or drive towards sustainability, starting with the implementation of appropriate planning, which has been considered as a key step and tool for port development.

The maritime transport industries are progressing towards sustainable practices and operating models. This will have a positive impact on the environment, as the maritime transport industry typically accounts for around 85% of the global trade volume. It is the main cause of pollution in shipping traffic within a port and port operations, and highlights the key relationship between shipping companies, port authorities and operators towards the goal of maritime transport sustainability.

The integration of green ports focuses on changing the climatic conditions and adopting mitigation measures into its plans and operations. Green practices are achieved by carrying out sustainable development that contributes toward social responsibilities and economic benefits in the maritime industries.

Green practices in shipping maritime industries include moving large quantities of cargo by energy efficient means, an evolving transition towards a low-carbon green economy across the world. This further helps in controlling the emission of pollution and achieving a greener environment.

Ports act as a gateway that connects multiple systems, from the above-mentioned maritime transport into the land-based transport systems, but also the wider urban system, for example local towns and cities or the wider region. For this reason, there is a

focus on the link between ports and cities and their sustainability profile.

Different legislations have been formulated that aim to integrate the environmental issues related to port development that are dependent on stricter standards. These cover a wide range of areas, from planning to operations. For example, certain issues have been analyzed relating to the operational strategies along with management of the green ports.

Several policies are implemented by the ports for reducing the emission of harmful substances. The green practices for maintaining port sustainability are carried out by designing the landscape for an appropriate seaport, involving the plantation of trees that are capable of absorbing noise and pollution. The use of renewable energy port operations and activities along with recycling and reuse of materials are important measures for maintaining the environmental sustainability of ports. The adoption of green practices contributes towards the development of the green ports by establishing environmental planning.

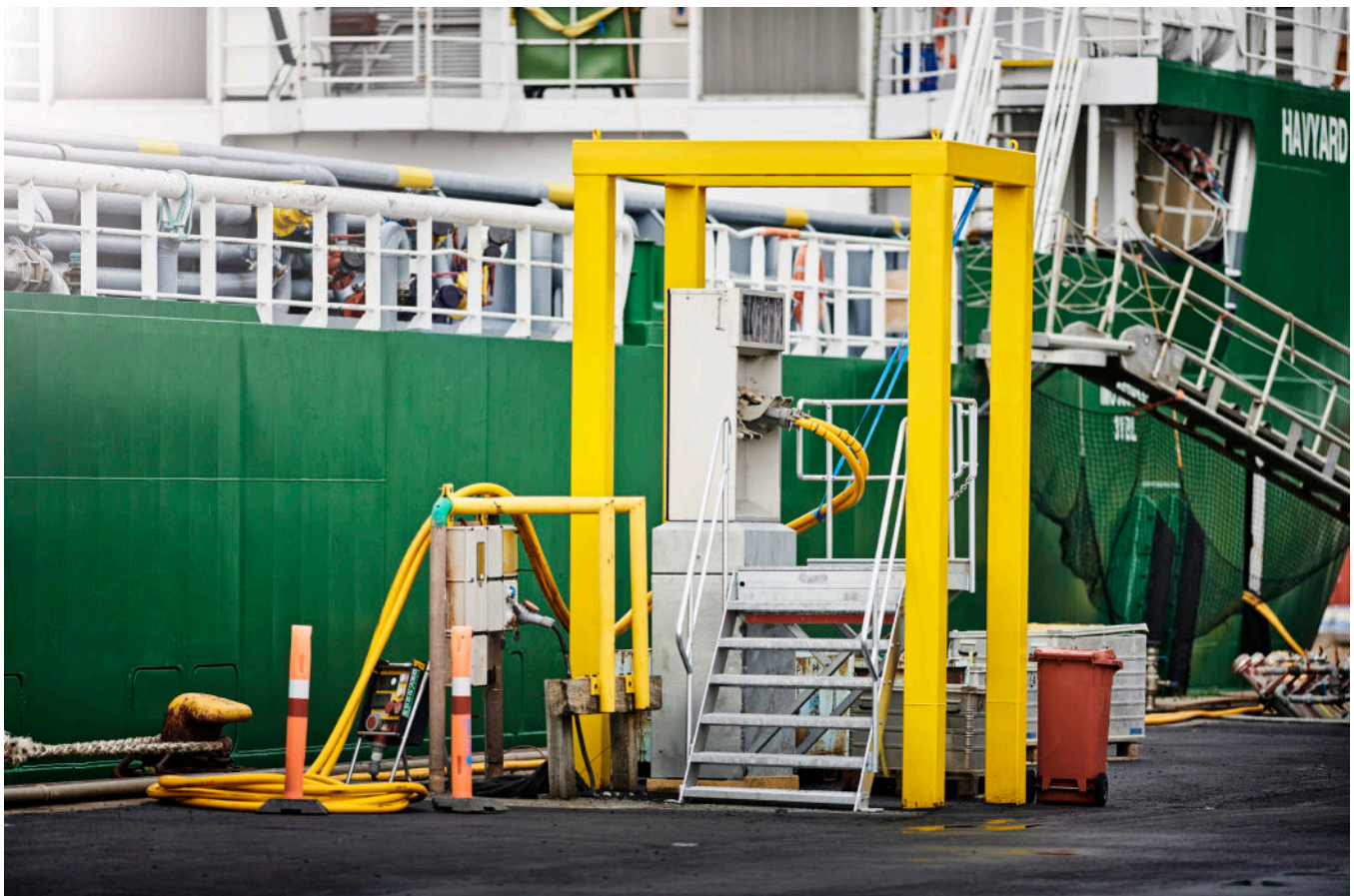
The past years have shown a rapid increase towards port operations while protecting the environment, as major global issues are arising involving climatic change and energy consumption in maritime shipping. The port industries have been facing several

challenges concerning environmental regulatory compliance.

The major environmental issues faced by the port industries involve the level of vessel and cargo handling operations, port extension projects, and hinterland accessibility. Also, appropriate capacity, along with good quality services and cost-effective solutions are important aspects in port development.

The adoption of green practices helps in meeting the needs of economic and environmental objectives that are acceptable and contribute towards the sustainable growth of the ports. The implementation of various green projects has been implicated for sustainable port development that results in resolving the decision-making issues and green project planning (GPP) problems. The port industries constitute the high energy consumption industries, hence, they have evolved the requirement for several green projects, as these industries have been facing increased competitive markets along with the need for energy-saving and emission-reduction.

The major environmental issues faced during port development include the increase in CO₂ emission, along with the construction cost and more energy consumption. The effective adoption of green practices helps in reducing CO₂ emissions, along with the reduction in construction costs and low energy





consumption. Appropriate green project planning has been adopted by several port industries for maintaining sustainability during port development.

The ports are responsible for formulating strict policies and regulations to run efficient port systems that would further help in monitoring energy and water consumption involving different indicators of the urbanized environment. The adoption of innovative management allows the establishment of environmentally friendly goals for carrying out operational port activities that further reduce the negative impact of the port activities.

An original framework in green and sustainable port strategy and propositions has to be developed. This is built on key constructs of stakeholder involvement, green market development, cost effective green policy, as well as sustainable port operations and development. Any green practices that are implemented must work towards improving the current energy availability without environmental deterioration and while utilizing cost-efficient resources.

Fulfilling the demand towards the global supply chain builds intense pressure

towards the port expansion, the immediate requirement for conserving the natural resources and the formulations of international regulations that have been mandatory implicating the fact that the ports have not only initiated the move towards maintaining the environmental sustainability but has also evolved into a demonstration of adopting innovative and sustainable practices.

The concept of port sustainability has gained awareness in maritime shipping that has attained new practices and new expertise which is environmentally friendly and often considered as green practice. Hence, port sustainability is maintained by the implementation of various business-related strategies and green practices for fulfilling the present and future requirements of the port industries while integrating human and natural resources.

This can be achieved if the port is capable of balancing its sustainability role in the form of coastal stewards, facilitators of commerce and transportation, and members of their respective communities. The implementation of green practices involves the adoption of the appropriate legislation that further elaborates the

evaluation towards sustainable practices along with evolving the opportunities and challenges towards the maintenance of sustainable port development.

The different environmental aspects concerning the port development implicate the characteristics of each port that constitutes the various environmental issues, such as air pollution, water quality, dredging and disposal of dredge materials, and storage, transport, and management of hazardous substances which needs to be assessed by adopting the green practices. The national and regional legislation that has involved international agreements on environmental regulations that affect the port's sustainable development has been assessed by the adoption of environmentally friendly practices.

Future aspects will evolve the concept of green ports and help in the establishment of the sustainable port, while reducing the negative impact on the environment. Therefore, appropriate planning, strategies, and initiatives need to be developed by the port industries for carrying out environmentally-friendly operational activities in maritime industries.

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