

Evolution and Current State of Floating Ports/Harbours/Terminals: A Comprehensive Review

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Evolution and Current State of Floating Ports/Harbours/Terminals:

A Comprehensive Review

Abstract

Imagine ports no longer anchored to the shore but floating on the sea. As part of a bigger project on Floating Futures, our study explores the revolutionary concept “Floating Ports” examining the state and progression of knowledge on floating ports/ harbours and terminals. It investigates the current knowledge landscape and historical evolution, providing an overview that identifies key trends and research gaps, guiding future studies and policy directions. A systematic, keyword-based approach is used, initially gathering literature on “floating” concepts from key databases before narrowing the focus to “floating ports/terminals”. Two study groups are identified: those directly addressing floating ports and those covering adjacent but relevant concepts. The direct studies are categorized into four subgroups based on maritime transport elements: Maritime Shipping, Port, Management and Ancillary. It shows that current studies are heavily focused on the element of Port, highlighting the early developments that explored the Construction and Port Operator sub-elements in greater depth. Clustering techniques are employed to identify trends and gaps, providing valuable insights to guide the future development of floating ports and terminals. Before 2000, foundational research focused on fender systems, breakwaters, and floating berths, exploring structural durability and wave attenuation. Between 2000 and 2010, studies advanced the understanding of dynamic responses in waves, mooring, and hydrodynamic analysis, supporting floating terminals in complex environments. From 2010 to 2020, extensive research emerged on Very Large Floating Structures (VLFS), exploring tsunami resilience, modularity, and energy efficiency, showcasing floating ports as sustainable solutions in constrained spaces. Since 2020, research has concentrated on renewable energy integration and advanced performance-based designs, examining floating ports for critical applications like disaster prevention, offshore support, and energy conversion. Further, we recommend cross-disciplinary collaboration in maritime logistics, port operations, governance, engineering, economics, policy-making, and law to integrate expertise and further this research field.