

Sustainability at Maritime Mobility: Comparing Open Data Ecosystems and Collaborative Maritime Platforms

Proposing a structured evaluation and verification framework for maritime Open Data Platforms and Open Data and Collaborative Platforms

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Why This Research?

FOUNDATIONAL REFERENCE — Ferreira et al. (2025)

"Why do open data platforms fail? — A revised conceptual model with mitigation actions"

Identifies structural and organizational barriers to ODP adoption. Establishes that platform failure is systemic — not merely technical — and raises the question of what makes platforms succeed in complex, multi-stakeholder sectors such as maritime logistics.

THE GAP

Despite growing digitalization in maritime logistics, **no structured framework existed** to systematically evaluate and compare ODP and ODCP in port environments — particularly from a **sustainability** and **port-city integration** perspective.

What This Study Seeks to Answer

RQ 1

What ODP and ODCP are currently used in the maritime port sector, or how common this type of platform is in world-class ports?

RQ 2

How are sustainability and port-city integration — across economic, environmental, and social dimensions — addressed in existing maritime platforms and literature?

RQ 3

What evaluation and verification framework can support the assessment and design of maritime ODCP, covering sustainability, interoperability, and port–city integration?

CONTEXT

Ports as nodes of sustainable urban mobility: traffic, congestion, emissions, land use, and multimodal integration all depend on data coordination.

Literature Review

Bibliometric Analysis (VOSviewer)

Empirical Platform Assessment

Framework Development

Multi-Stage Research Design



Literature Search

Web of Science
Query strings on ODP, ODCP,
maritime, sustainability



Bibliometric Analysis

VOSviewer
2 corpora:
57 + sustainability



Port Survey

WSC Top 50
Container Ports
ODP availability



Platform Audit

39 platforms
assessed across
10 dimensions



Framework Proposal

9-dimension evaluation &
verification framework
for maritime ODP/ODCP

110

documents
retrieved

57

peer-reviewed
articles

6 + 0

6 sustainability articles
0 port-city integration articles

50

container
ports surveyed

39

platforms
assessed

State of Research on Maritime ODP/ODCP

Emerging Field

Research only consolidated after 2020. Almost a complete gap until 2016.
Peak in 2022. Active and growing in 2025.

Disciplinary Concentration



Dominated by Oceanography, Environmental Sciences & Marine
Engineering. Information Systems underrepresented.

Fragmented Collaboration

US and Italy as central hubs. European cooperation present but limited. No
dominant institution.

Sustainability: Underexplored

Only 6 scientific articles explicitly address sustainability as a whole. Emerged
after 2018, remained discontinuous as of the date of this article's writing.

Publication trend (57 articles) → 2014 ■■ 2019 ■■■■ 2020 ■■■■■■ 2022  peak 2025  active

Open Data Availability: A Fragmented Landscape

28 / 50

ports (56%) have some
form of open data available

18

ports with no visible
ODP or ODCP platform

4

ports without a
dedicated authority website

- Strong performers include Rotterdam, Singapore, Hamburg, Los Angeles, Antwerp — mature digital ecosystems with accessible data portals.
- Shanghai — the world's busiest container port — has NO open data platform. Same for ports like Manila or Tokyo. Others have platforms, but mainly with statistical data.
- Clear implementation gap: even among the Top 50, nearly half have limited or no ODP/ODCP — signaling a strategic opportunity.
- Data provision and sustainability are not yet systematically linked at the port level.

What Exists at Sector Level

Maritime-Specific

NXTPort, EMSA, MarineTraffic, EQUASIS, PortCOM

Ocean & Environment

EMODnet, World Ocean DB, CoastObs, EuroGOOS

Multi-domain / Stats

Eurostat, OECDiLibrary, UNCTAD, ESRI, ITF

Spatial Planning

European MSP Platform, Menegon Geoportal,
Admiralty

Sustainability / Policy

UN SDG 14, IMO GHG Data, EMTER, Blue Cloud

Real-Time / Tracking

MarineTraffic, VesselFinder, openAQ, Saildrone

Key Finding: Most platforms are **data-centric rather than collaborative**. One-way publication dominates. Integrated multi-stakeholder functionalities and economic or social sustainability KPIs are **absent or inconsistent** across the majority.

Evaluation & Verification Framework for Maritime ODCP

Dual purpose: evaluation checklist for existing platforms · design guide for new ODP and ODCP · grounded in literature, bibliometric analysis and empirical platform assessment



Data Properties

Periodicity, formats,
real-time capability



Access & Management

API, deployment,
integration options



Security & Compliance

Auth, open data standards,
regulatory alignment



Features & Functionality

Search, visualization,
data linkage tools



Costs & Pricing

Free access, licensing,
subscription models



Sustainability

Environmental management,
hosting, KPIs



UI/UX Evolution

Interface changes tracked
via Wayback Machine



Community & Support

Documentation, forums,
professional support



Port–City Interface & Urban Mobility Integration

NEW DIMENSION

Multimodal connectivity · Operational data sharing · Spatial & coastal planning · Regulatory compliance · Multi-stakeholder accessibility · Environmental monitoring

From Fragmented Data to Integrated Governance

- 01 **The gap is real.** Most Top 50 ports lack systematic open data provision. Sustainability-focused research remains scarce and discontinuous. And **collaboration lags**. Existing platforms are data-centric. Collaborative and integrative functionalities are consistently underdeveloped.
- 02 **A framework to evaluate and verify maritime ODP/ODCP.** 9 structured dimensions - from data properties and security to sustainability and port-city integration - serve as both a practical checklist and a design guide.
- 03 **Limitations:** Scope restricted to WSC Top 50 ports * Reliance on publicly visible information only * Absence of end-user perspectives * Per-platform results not individually reported * Sustainability bibliometric corpus limited to six articles * An exploratory design that precludes causal conclusions.
- 04 **Next steps:** Delphi validation * Per-platform benchmarking matrix * Operational KPI integration * Empirical port-city testing with urban planners



Thank You.

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