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Measuring Green Port Management as determinant of Port Attractiveness and Competitiveness

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Outlines

► From ‘how ports are perceived’ to the introduction of the Concepts ‘Green Port Management, port attractiveness, and port competitiveness’;

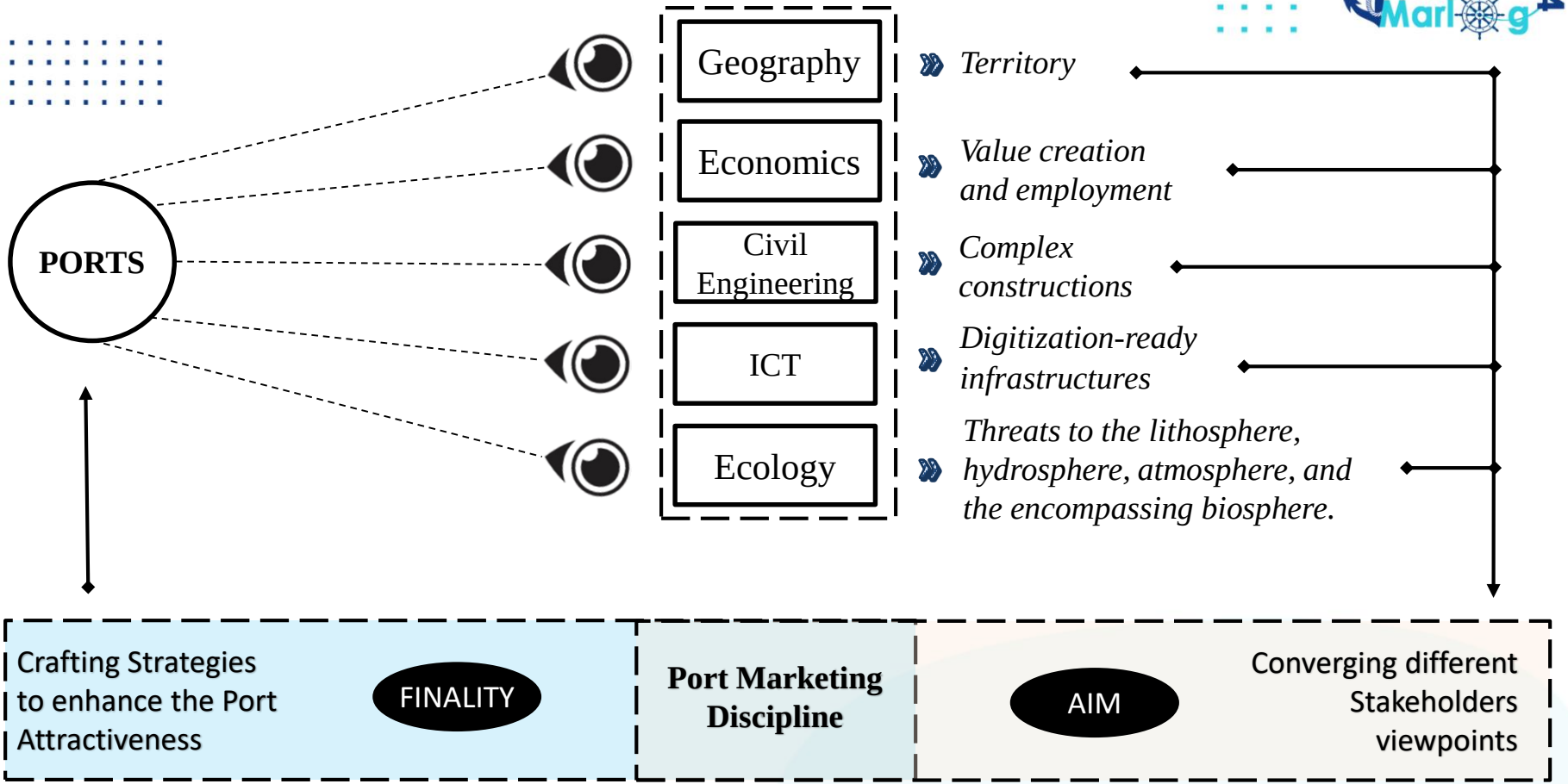
► Methodology and Research Process followed;

► Green Port Management Determinant = 7 attributes extracted from 15 Papers;

► Implementation of the 'GPMan' tool and Future Research Agenda;

► Matching the 7 items with real African cases (examples) ;

► Our Motto on Territorial Attractiveness


PORTS
Geography
Economics
Civil Engineering
ICT
Ecology
Territory
Value creation and employment
Complex constructions
Digitization-ready infrastructures
Threats to the lithosphere, hydrosphere, atmosphere, and the encompassing biosphere.
Crafting Strategies to enhance the Port Attractiveness
FINALITY
Port Marketing Discipline
AIM
Converging different Stakeholders viewpoints

Fundamentals: A Reminder

PRODUCT

4 Ps

Product
Price
Place
Promotion

McCarthy
(1960)

SERVICE

7 Ps

Product
Price
Place
Promotion
People
Process
Physical evidence

Booms and Bitner
(1981)

TERRITORY
(PORT CASE)

9 Ps

Port Location
Port Connectivity
Port Facilities
Port Costs
Port Service Quality
Port Policy and Management
Port Governance
Port External Environment
Green Port Management

Adarrab *et al.*
(2023)

GAP ?

integrating this determinant into academic research on port attractiveness and competitiveness.

RECENT WORKS ?

Munim et al, indicates a burgeoning interest in incorporating environmental factors into port attractiveness assessments, underscoring the growing importance of environmental considerations in the wider context of port competitiveness and attractiveness.

CENTRAL QUESTION

What are the attributes of Green Port Management as a determining factor in port attractiveness?

Concepts' Literature Review

GREEN PORT

PORT ATTRACTIVENESS

PORT COMPETITIVENESS

Lam and Notteboom [24] focus on how leading ports in Asia and Europe utilize pricing, monitoring and measuring, and market access control to enhance green port development.

Acciaro et al. [1] argue that active energy management can lead to substantial efficiency gains, contribute to new revenue sources, and ultimately enhance the competitive position of ports.

Acciaro et al. [2] deduce that there is a need for advanced conceptual frameworks that account for the multi-stakeholder nature of the port industry and the interactions required for environmental sustainability

Acciaro et al. [2] and Parola et al. [35] both underscore the necessity of innovation in the port and shipping sectors for sustainability, emphasizing that successful adoption of technologies such as onshore power supply and alternative fuels hinges on alignment with port stakeholders' demands

Ergin and Eker [19] discuss how green port projects, aimed at reducing environmental impacts of ship and port operations, have become a competitive necessity.

What is even more surprising in the port context is that the more efficient we become, the less polluting we are.

Concepts' Literature Review

GREEN PORT

PORT ATTRACTIVENESS

PORT COMPETITIVENESS

The concept of port attractiveness is articulated as a comprehensive framework evaluating a port's ability to satisfy and surpass the diverse needs of its stakeholders by leveraging a constellation of determinants and attributes [3]. By integrating these elements, it offers a nuanced perspective on the factors that make a port a favorable destination for shipping lines, cargo owners, service providers, external investors, and tourists, to name a few.

As a reminder, among the determinants of attractiveness previously mentioned is 'Green Port Management' [3,30].

Munim et al. [30] highlight the growing importance of green port practices in determining a port's attractiveness.

according to Acciaro et al. [2], environmental sustainability and innovation contribute to a port's attractiveness by enhancing its green profile and compliance with environmental regulations.

Attractiveness or competitiveness ???

Concepts' Literature Review

GREEN PORT

PORT ATTRACTIVENESS

PORT COMPETITIVENESS

Port competitiveness, as discussed in Ding et al. [15], is closely linked to the concept of port attractiveness.

The competitiveness of a port is perceived as a function of its ability to meet the demands of port users and provide superior services, which in turn is influenced by the port's attractiveness determinants.

In other words, port attractiveness, determined by specific key factors, serves as a prerequisite for achieving competitiveness [15].

Acciaro et al. [1,2] emphasize the critical role of energy management in boosting port competitiveness, positing that ports focusing on energy efficiency and sustainability are better positioned in the market.

They argue that while environmental performance may result from competitive pressures necessitating a balance between efficiency, regulatory compliance, and sustainability, innovation in green practices is essential for maintaining competitiveness.

Literature insights on the trinity link?

Concepts' Literature Review

GREEN PORT

PORT ATTRACTIVENESS

PORT COMPETITIVENESS

In exploring the linkage between 'GPMan', port attractiveness, and port competitiveness, existing literature underscores a fundamental interconnectedness that pivots on sustainability as an indirect enhancer of port customer satisfaction.

Acciaro et al. [1,2] delineate how active engagement in energy management and sustainability practices not only bolsters a port's environmental credentials but also augments its attractiveness and competitive edge by aligning with the evolving sustainability expectations of stakeholders.

Parola et al. [35], who articulate that the challenges of sustainability are intrinsically linked to a port's competitiveness and attractiveness, advocating for sustainability to be viewed as a strategic imperative rather than merely a compliance obligation.

Notteboom and Rodrigue [33] extend this discourse by highlighting how sustainable practices in hinterland development not only fulfill environmental responsibilities but also optimize operational efficiency, thereby enhancing the port's appeal and competitive stance in global supply chains.

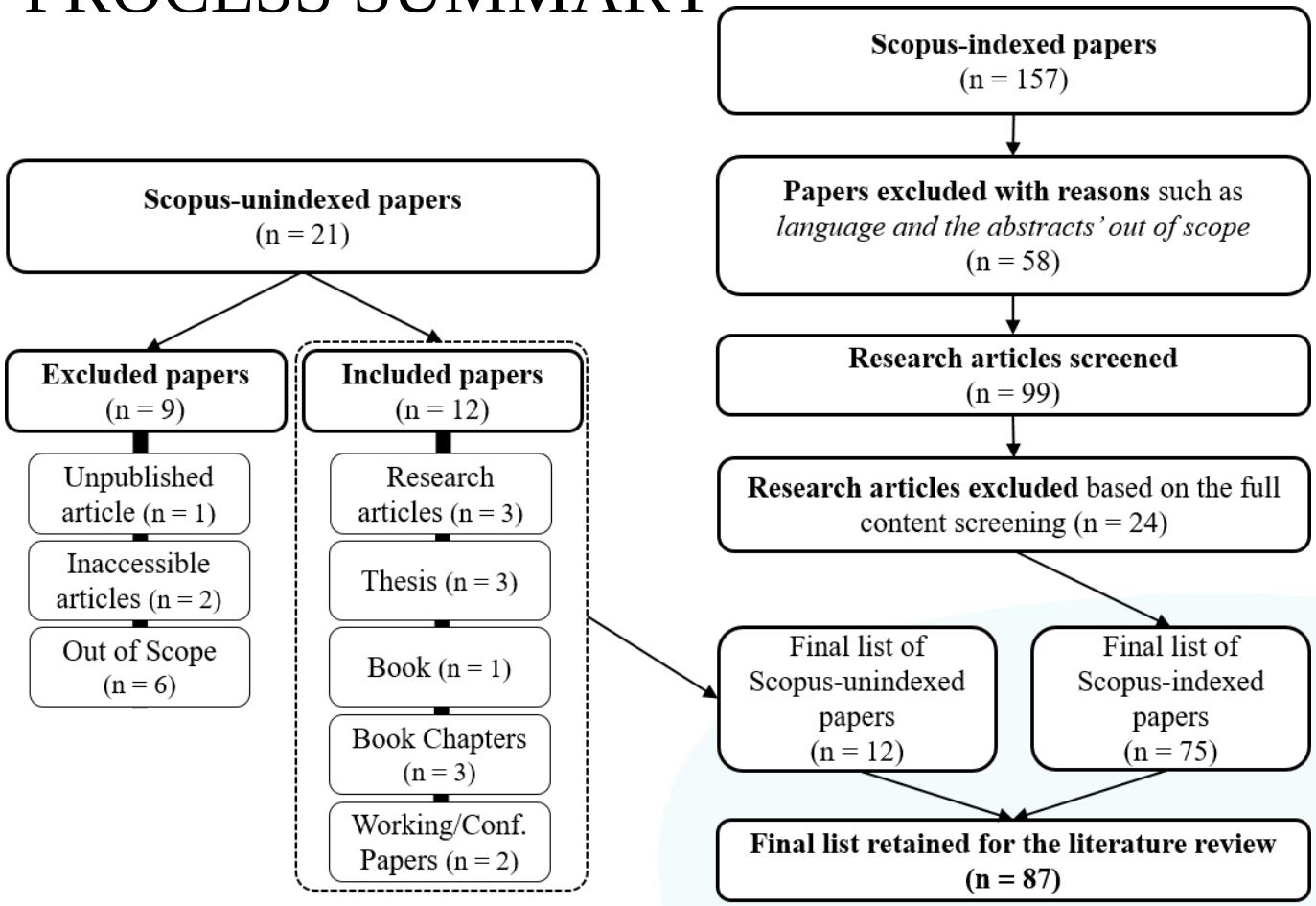
Collectively, these studies illuminate a synergistic relationship where 'GPMan' is a determinant of port attractiveness and competitiveness, indicating that embracing sustainability is a strategic pathway to achieving market superiority and ecological equilibrium in the logistics sector.

METHODOLOGY

LITERATURE APPROACH	SYSTEMATIC LITERATURE REVIEW **(SLR)**
PERIOD	FROM **1970** TO **2022**
KEYWORDS' QUERY	"attractive*" **OR** "competitive*" **OR** "selection" **OR** "choice" **AND** "port*" **OR** "seaport*" **OR** "criteri*" **OR** "factor*" **OR** "determinant*"
SCOPUS FIRST RESULTS	**157** SCIENTIFIC PAPERS
EXCLUSION CRITERIA	Language **(-6)**, Research scope (e.g., medicine, biology, physics) **(-20)**, Abstract scope **(-32)**, Full text-examination (**-24**).
INCLUSION CRITERIA	All type of paper were retained, Maintaining paper count unchanged.
REDUCING BIAS OF SLR	Incorporate some relevant Scopus-unindexed papers (**+12**)
FINAL SAMPLE	**87** Papers
THOROUGH SCRUTINY	**116 attributes** related to the **9 Port Attractiveness Determinants (PADs)** were extracted.

The added strings ensure that the search results are relevant.

PROCESS SUMMARY



SAMPLE METRICS: ITEMS AND DETERMINANTS

PADs	Total number of items	Total number of papers (max = 87)
Port Location	9	58
Port Connectivity	9	68
Port Service Quality	23	68
Port Facilities	26	71
Port Policy and Management	13	57
Port Costs	15	72
Port External Environment	7	39
Green Port Management	7	15
Port Governance	7	13
Total items	**116**	-

Source: Adarrab *et al*. (2023)

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

BIBLIOMETRIC CRITERIA

Six key aspects :

- **P**ublication **Y**ear;
- **A**uthorship;
- **P**aper **T**ype;
- **C**itation **F**requency according to **Google Scholar**;
- **P**ublishers/**J**ournals **T**itle where these papers appeared; and
- **S**cimago **J**ournal **R**anking score **(SJR H-INDEX)**.

CONTENT CRITERIA

Three principal areas:

- **T**ypes of **T**raffic discussed/Studied;
- **M**ethods used; and
- **C**ase **S**tudies undertaken.

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

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CONTENT CRITERIA

RESULTS

BIBLIOMETRIC CRITERIA

CONTENT CRITERIA

Table 1. Metrics of the Green Port Management's corpus

Year	*Author(s)*	*Paper Type*	*Google scholar citation**	*Editor/Journal title*	*SJR H-index**
1986	Branch [7]	Book	194	Chapman and Hall Ltd (London & USA)	n.a
2005	Notteboom and Rodrigue [33]	Article	1713	Maritime Policy and Management	67
2008	De Martino and Morvillo [14]	Article	170	Maritime Policy and Management	67
2012	Bergqvist and Egels-Zandén [9]	Article	130	Research in Transportation Business and Management	45
2014	Lam and Notteboom [24]	Article	368	Transport Reviews	100
2014a	Acciaro *et al.* [1]	Article	348	Energy Policy	254
2014b	Acciaro *et al.* [2]	Article	295	Maritime Policy and Management	67
2014	Wang *et al.* [43]	Article	86	Transport Policy	113
2016	Mittal and McClung [29]	Article	18	Journal of the Transportation Research Forum	5
2017	Parola *et al.* [35]	Article	220	Transport Reviews	100
2018	Marek [49]	Conference Paper	3	SHS Web of Conferences - GLOBMAR 2018	n.a
2019	Ding *et al.* [15]	Article	30	Maritime Policy and Management	67
2019	Ergin and Eker [19]	Article	12	Transactions of the Royal Institution of naval Architects Part A: International Journal of Maritime Engineering	20
2019	De Icaza *et al.* [13]	Article	6	Decision Analysis	26
2022	Munim *et al.* [30]	Article	2	Case Studies on Transport Policy	31

**Data updated on December 3th, 2023*

Source: Authors

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

BIBLIOMETRIC CRITERIA

CONTENT CRITERIA

Three principal areas:

- **T**ypes of **T**raffic discussed/Studied;
- **M**ethods used; and
- **C**ase **S**tudies undertaken.

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

BIBLIOMETRIC CRITERIA

Three principal areas:

• **T**ypes of **T**raffic discussed/Studied :

► **40%** of the papers used for extracting attributes of 'GPMan' determinant focused on ports handling **container traffic**, representing **six** of the **15** papers.
► **40%** of the papers did not differentiate between **specific types of port traffic.**

CONTENT CRITERIA

- **M**ethods used; and
- **C**ase **S**tudies undertaken.

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

BIBLIOMETRIC CRITERIA

CONTENT CRITERIA

Three principal areas:

- **Types of Traffic discussed/Studied;**
- **Methods used :**

► Preference for **M**ulti-**C**riteria **D**ecision-**M**aking **M**ethods was evident.
► Mittal and McClung [29] adopted the **A**nalytic **H**ierarchy **P**rocess '**AHP**',
► Ergin and Eker [19] implemented the **T**echnique for **O**rder of **P**reference by **S**imilarity to **I**deal **S**olution in its Fuzzy form '**Fuzzy TOPSIS**'.
► Ding et al. [15] and Wang et al. [43] both employed **combined methods**, with : the former incorporating '**AHP**' and the '**D**ecision-**M**aking **T**rial **and E**valuation **L**aboratory' approach, while the latter utilized '**Fuzzy DELPHI**' **and** '**TOPSIS**'.
► Munim et al. [30] utilized Confirmatory Composite Analysis using Partial **L**east **S**quares **S**tructural **E**quation **M**odelling (**PLS-SEM**).

- **Case Studies undertaken.**

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

BIBLIOMETRIC CRITERIA

Three principal areas:

- **Types of Traffic discussed/Studied;**
- **Methods used; and**
- **Case Studies undertaken:**

► **10** papers that specified port locations
► **Asian** ports were the most examined, represented in **6 papers**,
► **European** ports in **5**, and
► **North American** ports in **3**.
► **No studies** within this corpus focused on **ports in Africa**, **South America**, or **Australia** in the context of '**GPMan' as a determinant of port attractiveness**.

CONTENT CRITERIA

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

It is important to note that the frequency of citation serves as an indicator of how often specific attributes are discussed in the literature (**Table 2**).

… attributes with lower citation frequencies are not necessarily less important than those with higher frequencies.

Table 2. Framework for evaluating GPMan as PAD.

Green Port Management (GPMan) as Port Attractiveness Determinant (PAD)			
Item Code	*Measurements*	*Frequency of citation*	*Sources*
Gpm_Gppr	Environmental sustainability of the economic activities linked to the port that include green port projects such as protecting water quality and animals, reducing harmful air emissions, carbon neutrality/carbon footprint, and others environmental solutions-alternatives initiatives	14	Munim *et al.* [30] ; Ding *et al.* [15] ; Ergin and Eker [19] ; Marek [27] ; Bergqvist and Egels-Zanden [9] ; Notteboom and Rodrigue [33] ; De Martino and Morvillo [14] ; Lam and Notteboom [24] ; Acciaro *et al.* [1] ; Acciaro *et al.* [2] ; Parola *et al.* [35] ; Branch [7] ; Mittal and McClung [29] ; De Icaza *et al.* [13]
Gpm_Rpeg	Reward or punishment of port operators over/under performing against specific environmental goals	5	Munim *et al.* [30] ; Bergqvist and Egels-Zanden [9] ; Lam and Notteboom [21]; Acciaro *et al.* [2] ; Wang *et al.* [43]
Gpm_Ware	Waste reception facilities within the port	2	Munim *et al.* [30] ; Acciaro *et al.* [1]
Gpm_Ciga	Communication of information on green activities of the port (e.g. environmental report)	4	Munim *et al.* [30] ; Ergin and Eker [19] ; Lam and Notteboom [24] ; Acciaro *et al.* [2]
Gpm_Iems	Implementation of 'Environmental Management System' (EMS)	2	Lam and Notteboom [24] ; Acciaro *et al.* [2]
Gpm_Ispe	Implementation of system for the production of energy from renewable resources	2	Acciaro *et al.* [1] ; Acciaro *et al.* [2]
Gpm_Iner	Implementation of national/regional/global environmental regulation.	7	Munim *et al.* [30] ; Ding *et al.* [15] ; Bergqvist and Egels-Zanden [9] ; Notteboom and Rodrigue [33] ; Lam and Notteboom [24] ; Acciaro *et al.* [1] ; Acciaro *et al.* [2]
Source: Authors			

This observation holds true for the entire model, *(Both Attributes and determinants)* as illustrated in **Figure 2**.

RESULTS : Sample Metrics & Framework for evaluating Green Port Management (GPMan)

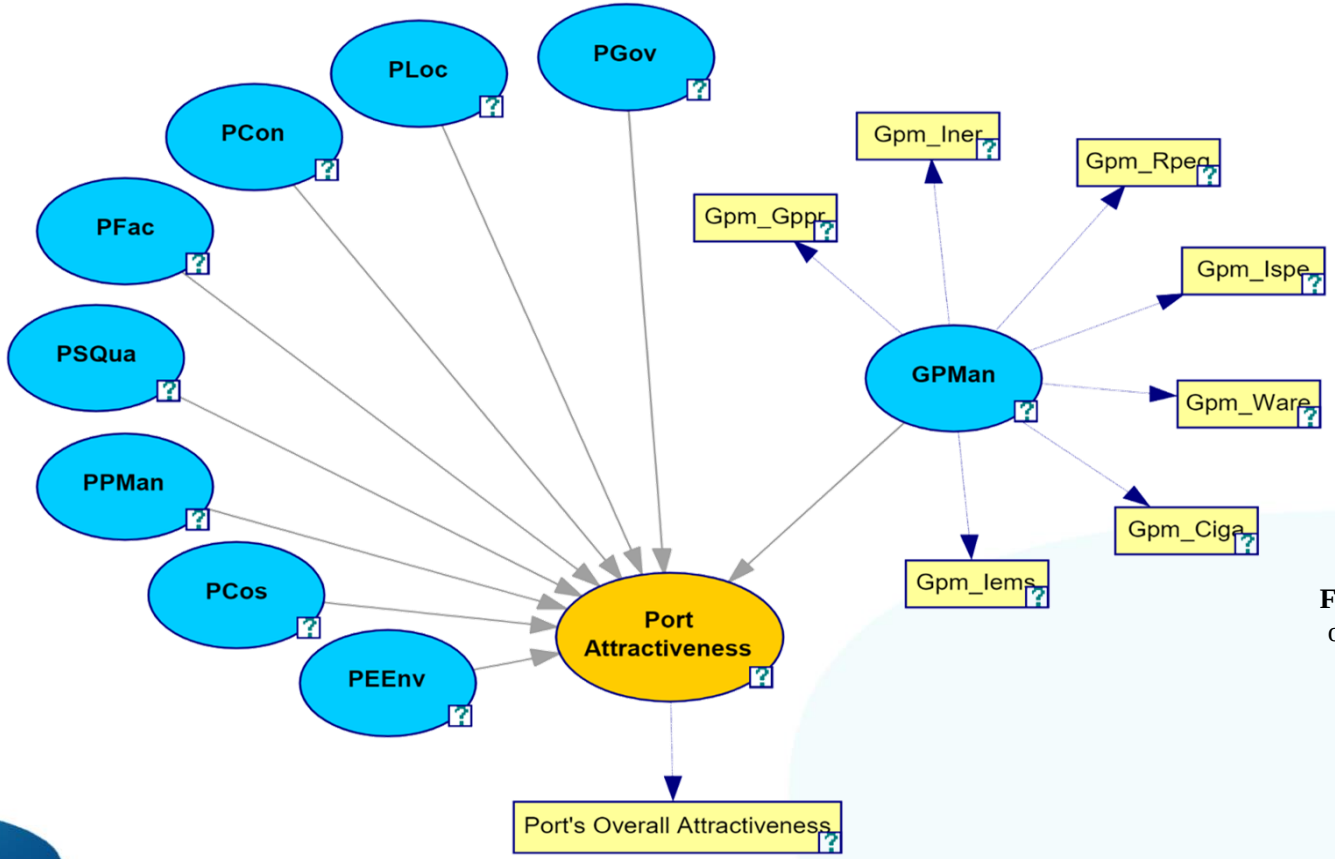

Figure 2: Modelling the measurement of 'GPMan' as one of the Nine PADs

Source: Authors, based on 'GeNIe Modeler' software and inspired by Adarrab *et al.* [3]

DISCUSSION

- Evol. of envir. Consid. in P.A
- 'GPMan' and other Indices tools
- How it works?
- Insi. into the Fut. Res. Agenda
- African Cases
- Limitat. & Recom.

In today's context of increasing environmental concerns, ‘GPMan’ has shifted from **optional to essential for attracting environmentally-focused partners and investors** [26].

Branch's [7] **pioneering work** emphasized ecological aspects in port environments, leading to the rise of ‘GPMan’ in Notteboom and Rodrigue's [33] studies and further development by De Martino and Morvillo [14].

Avom and Gandjon Fankem [6] argued for **public policies that balance environmental and territorial attractiveness**, a concept Alix and Guy [5] noted is gaining attention, especially **regarding environmental factors**.

Ergin and Eker [19] stated that **environmentally friendly initiatives** in ports are crucial, making **environmental considerations a core element in port attractiveness research.**

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Some existing tools/indices

By international organizations
'Environmental Ship Index'
(IAPH, 2011)
'Environmental Port Index'
(Det Norske Veritas, 2019)

By Academics and Research
'Maritime Environmental Performance Indices'
(Christodoulou, 2019)
'Port Environmental Performance Index (PEPI)'
(Ravn, 2021)

Evaluating environmental issues in terms of impact/performance of the Port and/or Maritime Activities

GPMan, as PAD

7 items' code:

Gpm_Gppr
Gpm_Rpeg
Gpm_Ware
Gpm_Ciga
Gpm_Iems
Gpm_Ispe
Gpm_Iner

Enhancing port environmental appeal.. complementing, not duplicating, other tools.

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One prominent characteristic of ports is their **uniqueness**, which highlights **the need to adapt any assessment tool** to a variety of context-specific factors, such as the **type of cargo handled**, the **governance structure**, and the **port's geographical location**.

For the successful implementation of the 'GPMan' tool described in this study, We suggest to users of the GPMan's framework to follow two steps :

► **Step 1 : Use Multi-Criteria Decision-Making to contextualise the assesment tool to the specific-area concerned. The most suggested tools :**

AHP, developed by Thomas Saaty in 1971 [45];
ANP, and its Fuzzy variant (FANP) [39];
PROMETHEE [8];
TOPSIS, introduced by Hwang and Yoon [22], and its Fuzzy version [10];
ELECTRE, introduced by Bernard Roy in 1968 [38];
DEMATEL, introduced by Fontela and Gabus in 1972 [40].

It is noteworthy that while the results may vary depending on the method used for evaluating significance, the overarching goal remains the same: **to gauge the perceptions of decision-makers about importance of the attributes in enhancing the attractiveness of the port in study.**

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For the successful implementation of the 'GPMan' tool described in this study, We suggest to users of the GPMan's framework to follow two steps :

► **Step 2 : M**easuring the attributes contextualized among the port's clients.

The final outputs allow for the identification of the environmental attributes of the port :

that contribute to its **attractiveness** (*Step 1's aim*) and;
those that are its **weaknesses** (*Step 2's aim*) .

Results' Application: a **strategic plan can be developed**, one that various stakeholders with different perspectives should adhere to.

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It is advisable to explore the theme of **port attractiveness by conducting case studies on African ports**.
(No studies within the corpus studied focused on ports in Africa … in the context of 'GPMan' as a port attractiveness determinant)

Other significant gap in existing literature is about the 'Type of Port Activity' perspective studied, we suggest to explore the Port Attractiveness :

The sector of **Cruise activities** and **Ferry services [25];**
The **Dry Bulk** and **Liquid Bulk Activities**.

The democratization of emerging technologies (*i.e., IoT, MLMs, No Code tools, AI*) is imperative for both Researchers and Academics. These technological advancements are instrumental in **processing extensive data from varied sources and integrating multiple indices collaboratively developed by both organizations and the academic community.**
(See Farzadmehr et al. (2023). 'Contemporary challenges and AI solutions in port operations: applying Gale–Shapley algorithm to find best matches')

Importantly, no singular model exists for the comprehensive analysis of environmental indicators, be it in assessing the impact of port activities or in enhancing port attractiveness.

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Green Ports Initiatives in African Ports

Recent research

Chukwuemeka *et al.* [12] explore the **emerging renewable energy sector on the continent**, driven by policy reforms and investment, while also recognizing significant socio-political and economic challenges.

Müller *et al.* [31] **examine the shift from fossil fuels to renewable energy**, highlighting the need for innovative resource extraction methods **in the 'Global South', including Africa.**

In practice

National Ports Agency (ANP, Morocco)

Implementation of a Sustainable development roadmap categorized into four main axes:
(i) Energy; (ii) Water; (iii) Port and Marine Environmental Preservation; and (iv) Resilience to Climate Change

Namibian Ports Authority (Namport, Namibia)

- Assessing the feasibility of solar and wind energy adoption at the Port of Walvis Bay;
- Pilot project aimed at adapting a tugboat for dual-fuel use, utilizing hydrogen and diesel.

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Table 3. Some African cases related to the Green Port Management's items

Item Code	*African case concerned*			*Title of the Project/Action*	*Project/Action's case consistency*
	Port	*Authority or Manager*	*Country*		
Gpm_Gppr	Port of Durban	Transnet National Ports Authority	South Africa	WILDOCEANS Blue Port Project	Durban Port's eco-restoration project focuses on cleaning and restoring the port's natural ecosystem. It includes low-cost waste management trials and a mobile app for reporting pollution. Supported by Grindrod Bank, the Blue Fund, and Nedbank's YES program, it also offers capacity building and work experience for local unemployed youth [44].
	Port of Mohammedia, Port of Casablanca, Port of Jorf Lasfar, Port of Safi and Port of Agadir	National Ports Agency	Morocco	Port Sanitation Project	The project aims to implement cleanliness measures, with a focus on identifying sources of liquid and solid discharges that could impact the water quality in port basins and adjacent areas. Biannually, water and sediment samples are collected from ports across the Kingdom by a state-approved laboratory. This is done to monitor the progression, nature, and sources of marine waste.
Gpm_Rpeg	Real Case of Punishment of an Operator at Port A	National Ports Agency	Morocco	Water and Land Area Patrol and Enforcement through the application of Article 110 of Law No. 67-14 on Port Police	The case, illustrating the consequences of environmental breaches in port operations, recounts an incident in which an operator triggered pollution while handling cargo within the port's land area. This narrative underscores the implementation of Article 110 of Moroccan port police legislation, which prescribes a penalty of 50,000 Moroccan Dirhams (DH).
	Real Case of Punishment of a Ship at Port B			Water and Land Area Patrol and Enforcement through the application of Article 125 of Law No. 67-14 on Port Police	This case highlights environmental violations in port operations as it describes a vessel's role in polluting a port basin with hydrocarbon discharges. It underscores the enforcement of Article 125 in Moroccan port police regulations, imposing imprisonment for 1 to 3 months and a fine of 20 Moroccan Dirhams per ton (with a minimum of 6,000 DH and a maximum of 200,000 DH).
Gpm_Ware	Tanger Med Port	Tanger Med Port Authority	Morocco	Waste reception facilities	The port complex at Tangier Med has implemented two wastewater treatment facilities, incorporating Sequencing Batch Reactor (SBR) systems for innovative and biological wastewater processing, conducted within cylindrical reactor units.

Source: Collected by authors

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Gpm_Ciga	Port Cotonou	Port Autonome de Cotonou	Benin	Environmental Status of the Port of Cotonou	In August 2023, the 'Port Autonome de Cotonou', in collaboration with Anvers Bruges International Ports, released a report on the environmental status of the Port of Cotonou. This comprehensive document details the port's environmental initiatives and challenges. [36]
	Namport	Namibian Ports Authority	Namibia	Carbon emissions reporting	Namport's carbon emissions annual reporting chapiter details data across three scopes: direct emissions, indirect electricity-related emissions, and broader indirect emissions. The reporting offer a comparison of the Carbon emissions during 5 last years [32].
Gpm_Iems	Tanger Med Port	Tanger Med Port Authority	Morocco	Waste management system	The port effectively manages liquid and solid waste from ships in compliance with MARPOL regulations. Liquid waste is collected and treated using barges and tanker trucks, while solid waste is gathered and processed by trucks. Furthermore, emissions from ship gas purifiers are collected and treated.
Gpm_Ispe	Port of Casablanca, Port of Mohammedia, Port of Jorf Lasfar	National Ports Agency	Morocco	Renewable Solar Energy	In order to enhance sustainability and reduce energy costs, the port authority have implemented the installation of both solar panels and photovoltaics, effectively harnessing renewable energy sources.
Gpm_Iner	Mombasa port	Kenya Ports Authority	Kenya	Green Port Policy	The Kenya Ports Authority (KPA) has adopted a Green Port Policy (GPP) to promote environmental sustainability in maritime activities. The policy requires transitioning incoming vessels from diesel to electric power to reduce emissions and enhance biodiversity conservation. This initiative highlights KPA's commitment to sustainable port management and the protection of marine ecosystems and resources [23].
	All Moroccan ports	Tanger Med Port Authority and National Ports Agency	Morocco	Law No. 67-14 on Port Police	Recently adopted in 2020, this law represents a significant update to Morocco's port legislation, with a specific focus on environmental matters. It has a broad impact on all ports within the Kingdom, aiming to establish a robust legislative framework that ensures optimal management and operations. This Law prioritizes safety, security, environmental protection, quality, and performance as key facets of port.

Source: Collected by authors

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Dependence on literature indexed by Scopus

► it is advisable to broaden the research scope by incorporating other databases such as Web of Science, JSTOR, CAIRN, or Google Scholar….. Despite including 12 non-Scopus-indexed papers due to their significant relevance..

Inclusion and exclusion criteria introduce biases in the sample selection process

► Future research should consider employing a hybrid literature review methodology that combines systematic and narrative review processes… Despite including gray literature, Book and Conference/Working paper.

Insufficient exploration of the contribution of technological tools to environmental sustainability goals

► it is recommended that academics pursue action research in collaboration with decision-makers and developers. This approach aims to align AI solutions more effectively with specific environmental sustainability challenges.

CONCLUSION

… **‘Green Port Management's (GPMan)’** transition from an optional to an essential practice in enhancing port attractiveness and competitiveness…

The study presents a **customized evaluation framework for ports**, considering their **diverse operations**, and **points out a research void in African ports…**

Seven ‘GPMan’ attributes are identified:

- ► environmental sustainability in port activities,
- ► incentivizing eco-friendly operations,
- ► waste management facilities,
- ► publicizing green efforts report,
- ► implementing Environmental Management Systems (EMS),
- ► renewable energy utilization, and
- ► adherence to environmental regulations,

Initiatives in enhancing Port Attractiveness, *particularly the **G**reen **P**ort **M**anagement Determinant*, collectively contribute to the enhancement of the attractiveness of the '**C-C-R-C-P**', which stands for five territorial dimensions:

Continent-Country-Region-City-Port nexus.

Arab Academy
for Science , Technology and Maritime Transport

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"MARLOG 13"

Thank You

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