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# Sustainability Perceptions and Practices in Port Operations: A Qualitative Study Among Transportation Professionals

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***Abstract***

*This qualitative study investigates sustainability perceptions and practices among transportation professionals in port operations. Through semi-structured interviews and analysis of international standards, key themes emerge regarding the importance of pollution reduction, adoption of green technologies, and challenges in implementation. Findings reveal a gap between awareness and action, highlighting the need for targeted interventions and capacity-building initiatives. Professionalism emerges as a critical factor in driving sustainability initiatives, underscoring the importance of training and knowledge-sharing platforms. Overall, the study contributes to the discourse on sustainability in transportation management and port operations, informing policy-making and strategic interventions aimed at fostering a culture of sustainability within the industry.*

***Keywords:*** *Sustainability, Transportation Professionals, Port Operations, Green Technologies, Professionalism.*



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## INTRODUCTION

The sustainability of transportation systems, particularly within the context of port operations, has emerged as a critical concern in contemporary discourse (Bican & Brem, 2020; R. Meyer, 2017). As globalization continues to drive increased trade volumes, the environmental impact of port activities has become a focal point for stakeholders across industries and academia. Within this milieu, understanding the perceptions and practices of transportation professionals directly engaged in port operations regarding sustainability is of paramount importance. This research seeks to delve into the intricate dynamics of sustainability perceptions and practices among these professionals, shedding light on their awareness of pollution issues, adoption of green technologies, and the challenges encountered in promoting sustainable practices within their organizations (IMO, 2018).

Transportation management, encompassing multimodal transport, logistics, and port operations, plays a pivotal role in facilitating global trade (Lei et al., 2017; Pallis, 2017). However, the environmental consequences of these activities, including air and water pollution, noise pollution, and habitat destruction, have raised pressing concerns about their long-term viability (Adeniran et al., 2020; Lyles, 1984). Consequently, there is a growing imperative to transition towards sustainable practices in port operations. This transition involves not only the adoption of green technologies but also a fundamental shift in the mindset and practices of transportation professionals involved in these operations.

Against this backdrop, this research sets out to achieve several objectives. Firstly, it aims to explore the depth of understanding among transportation professionals regarding sustainability issues in port operations. By conducting qualitative interviews with a diverse array of experts in the field, ranging from port managers to logistics coordinators, this study seeks to uncover the nuances of their perceptions towards sustainability and environmental stewardship (Glasson & Therivel, 2013; Scholz & Binder, 2011). Secondly, it endeavors to examine the extent to which these professionals have integrated sustainable practices into their daily operations (Elliott, 2012; Issariyakul & Dalai, 2014). From the adoption of shore power to the implementation of eco-friendly cargo handling techniques, this research aims to elucidate the tangible steps taken by port stakeholders towards achieving sustainability goals. Thirdly, this study seeks to identify the challenges and barriers faced by transportation professionals in promoting sustainability within their organizations. Whether it be budgetary constraints, institutional inertia, or regulatory hurdles, understanding these impediments is crucial for devising effective strategies to overcome them.

The significance of this research lies in its unique focus on the perceptions and practices of transportation professionals directly engaged in port operations. While existing literature often examines sustainability from a macroscopic

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perspective, analyzing regulatory frameworks or technological advancements, this study delves into the micro-level dynamics of organizational behavior and decision-making. By engaging with practitioners on the frontline of port operations, this research provides valuable insights into the ground realities of sustainability implementation. Moreover, by uncovering the motivations, challenges, and aspirations of these professionals, this study can inform targeted interventions aimed at fostering a culture of sustainability within the transportation industry (Pantouvakis & Vlachos, 2020). Despite the growing awareness of sustainability issues in port operations, there remains a noticeable gap in the literature concerning the perceptions and practices of transportation professionals. While studies have explored the environmental impacts of port activities and proposed regulatory frameworks for mitigating pollution, few have delved into the lived experiences and perspectives of those directly involved in day-to-day operations. This research seeks to bridge this gap by offering a nuanced understanding of the challenges and opportunities inherent in promoting sustainability within port environments. By doing so, it aims to catalyze dialogue, inspire action, and pave the way for a more sustainable future in transportation management and port operations.

This research endeavors to unravel the complexities of sustainability perceptions and practices among transportation professionals in port operations. By elucidating their understanding, motivations, and challenges, it seeks to inform policy-making, guide managerial decisions, and inspire transformative change within the transportation industry. Through qualitative interviews and descriptive analysis, this study aims to contribute to the burgeoning discourse on sustainability in port operations, offering fresh insights and innovative solutions to the challenges at hand.

## METHOD

The research methodology employed in this study aligns with the qualitative nature of the investigation, aiming to delve deep into the perceptions and practices of transportation professionals in port operations regarding sustainability (Padgett, 2016; Zhang et al., 2014). Qualitative research is chosen for its ability to capture the richness and complexity of human experiences, offering insights that quantitative methods may overlook. In this section, the research design, data collection procedures, and analysis techniques are outlined to provide a comprehensive understanding of the methodological approach adopted. The primary data collection method utilized in this study is semi-structured interviews. Semi-structured interviews provide the flexibility to explore diverse perspectives while maintaining a degree of consistency across respondents. Through open-ended questions tailored to the expertise and experiences of the participants, this method enables the researcher to uncover nuanced insights into sustainability perceptions and practices within port operations (Comtois & Slack, 2017). The

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interview protocol is designed to cover key themes such as awareness of sustainability issues, adoption of green technologies, and challenges faced in promoting sustainability within organizations.

A purposive sampling strategy is employed to select participants who possess relevant expertise and experience in transportation management, port operations, and related fields. The sample includes professionals from diverse backgrounds, including port managers, logistics coordinators, environmental specialists, and regulatory experts. By including a diverse range of perspectives, the research aims to capture the multifaceted nature of sustainability challenges and solutions within port environments. Data collection is conducted through in-depth interviews with each participant, either in person or via virtual platforms, depending on logistical considerations. Interviews are audio-recorded with the consent of the participants to ensure accurate capture of data. The researcher adopts an empathetic and non-directive approach during interviews, allowing participants to express their views and experiences freely. Probing questions are used to elicit detailed responses and clarify any ambiguities that may arise during the conversation (Padgett, 2016; Saldana, 2014).

Following data collection, thematic analysis is employed to identify patterns, themes, and variations in the responses. Thematic analysis involves a systematic process of coding and categorizing the data to uncover underlying meanings and insights. The researcher engages in iterative cycles of coding, comparing, and refining the data to develop a comprehensive understanding of the research topic. Themes emerge organically from the data, reflecting the shared experiences and perspectives of the participants. To ensure rigor and trustworthiness in the analysis process, several measures are implemented. Peer debriefing sessions are conducted to review and validate the interpretations of the data. Member checking is employed to verify the accuracy of the findings with the participants, allowing them to confirm or challenge the researcher's interpretations. Additionally, reflexivity is practiced throughout the research process, with the researcher acknowledging and critically examining their own biases and assumptions.

The findings of the study are presented thematically, accompanied by illustrative quotes from the participants to enrich the narrative. Through a detailed exposition of the sustainability perceptions and practices of transportation professionals in port operations, the research aims to contribute to the existing body of knowledge on this critical issue. By leveraging qualitative research methods to explore the lived experiences and perspectives of practitioners, this study offers valuable insights and recommendations for promoting sustainability within the transportation industry.

## RESULTS AND DISCUSSION

### *Results*

The results of the research provide a comprehensive understanding of sustainability

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perceptions and practices among transportation professionals in port operations. Through qualitative interviews and thematic analysis, key themes emerged regarding awareness, adoption, and challenges related to sustainability. In this section, the findings are presented using a structured approach, incorporating academic data and comprehensive tables to facilitate understanding and interpretation.

**Table 1: Importance of Sustainability Indicators in Port Operations**

| Indicator | Parameter | Weight | Intensity of Importance (1-5) | Score | Percentage |
|---|---|---|---|---|---|
| **Pollution Reduction** | Air Pollution | 0.15 | 4 | 0.6 | 15% |
| | Water Pollution | 0.15 | 4 | 0.6 | 15% |
| | Noise Pollution | 0.1 | 3 | 0.3 | 10% |
| **Green Technologies** | Shore Power | 0.2 | 5 | 1 | 20% |
| | Electric Vehicles | 0.15 | 4 | 0.6 | 15% |
| **Sustainable Practices** | Eco-friendly Cargo Handling | 0.15 | 4 | 0.6 | 15% |
| | Waste Management | 0.1 | 3 | 0.3 | 10% |
| **Regulatory Compliance** | Environmental Regulations | 0.1 | 5 | 0.5 | 10% |
| **Total** | 1 | | 4.5 | 10 | 0% |

The table above illustrates the importance of various sustainability indicators as perceived by transportation professionals in port operations. The indicators include pollution reduction, adoption of green technologies, sustainable practices, and regulatory compliance. Each indicator is further broken down into parameters, weighted according to their perceived importance, and assigned an intensity of importance rating on a scale of 1 to 5. The total score and percentage represent the cumulative importance of sustainability indicators in port operations, providing insights into areas of priority for sustainable initiatives.

**Table 2: Sustainability Practices Adoption Score**

| Participant | Eco-friendly Cargo Handling | Shore Power | Electric Vehicles | Waste Management | Total Score |
|---|---|---|---|---|---|
| **Participant 1** | 4 | 3 | 2 | 3 | 12 |
| **Participant 2** | 5 | 4 | 3 | 4 | 16 |
| **Participant 3** | 3 | 5 | 4 | 3 | 15 |
| **Participant 4** | 4 | 4 | 3 | 2 | 13 |
| **Participant 5** | 5 | 3 | 2 | 4 | 14 |
| **Participant 6** | 3 | 4 | 3 | 3 | 13 |
| **Participant 7** | 4 | 5 | 4 | 3 | 16 |
| **Participant 8** | 5 | 4 | 3 | 4 | 16 |
| **Participant 9** | 4 | 3 | 4 | 3 | 14 |
| **Partici** | 3 | 4 | 5 | 4 | 16 |

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|---|---|---|---|---|---|
| **pant 10** | | | | | |
| **Participant 11** | 4 | 5 | 4 | 3 | 16 |
| **Participant 12** | 5 | 4 | 3 | 4 | 16 |
| **Participant 13** | 4 | 3 | 2 | 3 | 12 |
| **Participant 14** | 3 | 4 | 3 | 4 | 14 |
| **Participant 15** | 4 | 5 | 4 | 3 | 16 |
| **Mean Score** | 4 | 4 | 3.33 | 3.27 | 14.6 |

The table above depicts the adoption score of sustainability practices among the participants. Each participant's adoption of eco-friendly cargo handling, shore power utilization, electric vehicle usage, and waste management practices is rated on a scale of 1 to 5. The total score represents the cumulative adoption of sustainability practices, providing insights into the prevailing trends and areas for improvement within port operations.

The results indicate a high level of awareness and importance assigned to sustainability indicators among transportation professionals in port operations. Pollution reduction, particularly in terms of air and water pollution, emerges as a top priority, reflecting the industry's recognition of environmental challenges. Additionally, the adoption of green technologies such as shore power and electric vehicles is deemed crucial for minimizing the carbon footprint of port operations.

However, despite the perceived importance of sustainability indicators, the adoption of sustainable practices varies among participants. While some demonstrate a high level of engagement, embracing eco-friendly cargo handling and shore power utilization, others lag behind in certain areas such as waste management. This disparity underscores the need for targeted interventions and capacity-building initiatives to promote holistic sustainability practices within the industry.

Furthermore, the research identifies several challenges hindering the widespread adoption of sustainable practices in port operations. Budgetary constraints, technological limitations, and regulatory complexities emerge as key barriers, highlighting the need for collaborative efforts between stakeholders to overcome these obstacles. Additionally, the lack of awareness and education regarding sustainable alternatives underscores the importance of capacity-building initiatives and knowledge dissemination within the industry. The results of the research provide valuable insights into sustainability perceptions, practices, and challenges among transportation professionals in port operations. By elucidating the prevailing trends and areas for improvement, this study informs policy-making, managerial decisions, and strategic interventions aimed at fostering a culture of sustainability within the transportation industry. Through targeted initiatives and collaborative efforts, the industry can mitigate environmental impacts, enhance operational efficiency, and pave the way for a more sustainable future.

In continuation of the exploration of sustainability perceptions and practices among transportation professionals in port operations, the second phase of the research delves deeper into the

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analysis of the data collected. This phase aims to provide additional insights, support the findings from the first phase, and offer a comprehensive understanding of the research landscape within the context of international standards and professionalism. Through detailed analysis and interpretation, this section strengthens the foundation laid by the initial results and contributes to the overarching goal of promoting sustainability within the transportation industry.

**Table 3: Analysis of Sustainability Practices Across International Standards**

| Sustainability Practice | International Standard | Compliance Level (1-5) | Score | Percentage |
|---|---|---|---|---|
| **Eco-friendly Cargo Handling** | ISO 14001: Environmental Management Systems | 4 | 0.8 | 20% |
| | GreenPort Environmental Standard | 3 | 0.6 | 15% |
| **Shore Power Utilization** | IMO Resolution A.1120(30): Guidelines for Onshore Power Supply Systems for Ships | 5 | 1 | 25% |
| | Green Marine Program | 4 | 0.8 | 20% |
| **Electric Vehicle Usage** | ISO 14001: Environmental Management Systems | 4 | 0.8 | 20% |
| | GreenPort Environmental Standard | 3 | 0.6 | 15% |
| **Waste Management** | ISO 14001: Environmental Management Systems | 4 | 0.8 | 20% |
| | GreenPort Environmental Standard | 3 | 0.6 | 15% |
| **Total** | | | 4.2 | 105% |

The table above presents an analysis of sustainability practices across international standards relevant to port operations. Each sustainability practice, including eco-friendly cargo handling, shore power utilization, electric vehicle usage, and waste management, is evaluated based on its compliance with internationally recognized standards such as ISO 14001 and specific port environmental standards. The compliance level is rated on a scale of 1 to 5, with 5 indicating full compliance and 1 indicating minimal compliance. The total score and percentage reflect the overall alignment of sustainability practices with international standards, providing insights into areas of strength and areas for improvement.

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Analysis:

The analysis of sustainability practices across international standards reveals a strong alignment with established guidelines and frameworks within the transportation industry. Eco-friendly cargo handling, for instance, demonstrates a high level of compliance with ISO 14001, emphasizing the industry's commitment to minimizing environmental impacts throughout the supply chain. Similarly, shore power utilization aligns closely with IMO Resolution A.1120(30), highlighting the industry's efforts to reduce emissions from maritime activities and promote cleaner energy alternatives.

Despite the overall alignment with international standards, there are areas where sustainability practices fall short of optimal compliance. Electric vehicle usage, for example, demonstrates moderate compliance with ISO 14001 and specific port environmental standards, suggesting room for improvement in the adoption of clean transportation technologies. Similarly, waste management practices exhibit a similar pattern, indicating the need for enhanced strategies and initiatives to minimize waste generation and promote recycling within port operations.

The discrepancy between the perceived importance of sustainability indicators and the actual compliance with international standards underscores the complexity of implementing sustainable practices within port environments. While transportation professionals recognize the significance of pollution reduction, green technologies, and sustainable practices, translating these aspirations into tangible actions requires overcoming various challenges, including technological limitations, financial constraints, and regulatory complexities.

Moreover, the analysis highlights the role of professionalism and expertise in driving sustainability initiatives within the transportation industry. Professionals equipped with the necessary knowledge, skills, and training are better positioned to navigate the complexities of sustainability implementation, identify opportunities for improvement, and drive organizational change. Investing in professional development programs, capacity-building initiatives, and knowledge-sharing platforms can empower transportation professionals to lead the transition towards a more sustainable future.

The second phase of the research provides valuable insights into the alignment of sustainability practices with international standards and the role of professionalism in promoting sustainability within the transportation industry. By analyzing compliance levels across key sustainability indicators and identifying areas for improvement, this study informs strategic decision-making, policy formulation, and capacity-building efforts aimed at fostering a culture of sustainability within port operations. Through collaborative efforts and a commitment to excellence in professionalism, the transportation industry can overcome challenges, seize opportunities, and achieve sustainable development goals on a global scale.

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***Discussion***

The discussion of the research findings illuminates the complex dynamics of sustainability perceptions and practices among transportation professionals in port operations. Drawing upon the results presented in two phases, this section delves into the implications, challenges, and opportunities inherent in promoting sustainability within the transportation industry (Docherty et al., 2018; Litman, 2016; Vuchic, 2017). The first phase of the research shed light on the importance assigned to sustainability indicators by transportation professionals in port operations. Pollution reduction emerged as a top priority, reflecting the industry's recognition of environmental challenges such as air and water pollution, and noise pollution. The adoption of green technologies, including shore power and electric vehicles, was also deemed crucial for minimizing the carbon footprint of port operations. Additionally, sustainable practices such as eco-friendly cargo handling and waste management were highlighted as essential components of sustainable port operations.

The second phase of the research provided a deeper analysis of sustainability practices across international standards relevant to port operations. While there was generally strong alignment with established guidelines and frameworks, areas for improvement were identified, particularly in electric vehicle usage and waste management. The discrepancy between perceived importance and actual compliance underscored the challenges inherent in translating sustainability aspirations into tangible actions within port environments. One key implication of the research findings is the need for targeted interventions and capacity-building initiatives to bridge the gap between awareness and action on sustainability issues (M. D. Meyer, 2016). While transportation professionals recognize the importance of sustainability indicators, translating this awareness into meaningful change requires overcoming various barriers, including technological limitations, financial constraints, and regulatory complexities. Investing in professional development programs, training initiatives, and knowledge-sharing platforms can empower professionals to lead the transition towards sustainable port operations effectively.

Furthermore, the research highlights the importance of collaboration and stakeholder engagement in driving sustainability initiatives within the transportation industry. Achieving sustainability goals requires collective action and partnerships between port authorities, shipping companies, regulatory bodies, and other stakeholders. By fostering collaboration and knowledge exchange, the industry can leverage collective expertise and resources to overcome challenges, seize opportunities, and advance sustainability agendas.

Moreover, the findings underscore the critical role of professionalism in promoting sustainability within the transportation industry. Professionals equipped with the necessary knowledge, skills, and training are better positioned to navigate the complexities of

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sustainability implementation, identify opportunities for improvement, and drive organizational change. Emphasizing professionalism and excellence in training and development initiatives can cultivate a culture of innovation, accountability, and continuous improvement within port operations. However, despite the progress made in promoting sustainability within the transportation industry, several challenges remain. Budgetary constraints, technological limitations, and regulatory complexities pose significant barriers to the widespread adoption of sustainable practices. Addressing these challenges requires a multifaceted approach, including policy reforms, financial incentives, and technological innovation.

Additionally, raising awareness and fostering a culture of sustainability among all stakeholders is essential for driving lasting change within the industry. The research findings provide valuable insights into sustainability perceptions and practices among transportation professionals in port operations. By highlighting the importance of pollution reduction, green technologies, and sustainable practices, the study underscores the industry's commitment to environmental stewardship (Oldenburg et al., 2010; Steg et al., 2013). However, translating sustainability aspirations into tangible actions requires overcoming various challenges and barriers. By investing in professionalism, collaboration, and targeted interventions, the transportation industry can accelerate progress towards achieving sustainability goals and pave the way for a more sustainable future.

## CONCLUSION

This research provides a comprehensive examination of sustainability perceptions and practices among transportation professionals in port operations. Through qualitative interviews, analysis of international standards, and discussions on professionalism, the study sheds light on the complexities and challenges inherent in promoting sustainability within the transportation industry. The findings highlight the importance assigned to sustainability indicators, such as pollution reduction and adoption of green technologies, by transportation professionals. However, there exists a gap between awareness and action, as evidenced by the varying levels of compliance with international standards across different sustainability practices. Overcoming this gap requires targeted interventions, capacity-building initiatives, and collaborative efforts among stakeholders. Moreover, the role of professionalism emerges as a critical factor in driving sustainability initiatives within the industry. By investing in training, development, and knowledge-sharing platforms, professionals can lead the transition towards sustainable port operations effectively. This research contributes to the growing body of knowledge on sustainability in transportation management and port operations. By identifying challenges, opportunities, and areas for improvement, the study informs strategic decision-making and policy formulation aimed at

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fostering a culture of sustainability within the transportation industry. Through concerted efforts and a commitment to excellence in professionalism, the industry can overcome obstacles, seize opportunities, and achieve sustainable development goals on a global scale.

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