The Impact of Ecoport Socialization and Port Waste Management System on Greenport Implementation

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Abstract

Port Waste Management System (PWMS) is a comprehensive waste management approach employed at ports to mitigate environmental harm. PWMS encompasses the collection, segregation, and disposal of various types of waste generated at ports, including solid, liquid, and hazardous waste. Through the adoption of sustainable technologies such as renewable energy and efficient water management, ports can significantly reduce their carbon footprint and ecological impact. Ecoport and Port Waste Management System advocate for sustainable practices within port operations. This study aims to assess the influence of the Ecoport Socialization Program on Greenport implementation at Tanjung Priok Port, aiming to enhance awareness regarding the importance of minimizing environmental impact and improving resource efficiency within the port sector. The findings indicate a positive and statistically significant relationship between the Port Waste Management System (X2) and Greenport Implementation (Y), with a coefficient value (Original Sample column) of 0.579 and P-Values of 0.000 < 0.05. Furthermore, the Q-Square (Q2) value for Greenport Implementation (Y) is 0.465, indicating that Ecoport Socialization (X1) and Port Waste Management System (X2) possess predictive relevance for Greenport Implementation (Y). Combined, Ecoport Socialization (X1) and Port Waste Management System (X2) account for 59.6% of the variance in Greenport Implementation (Y), with the remaining 40.4% attributable to other factors. In conclusion, this study demonstrates that Ecoport socialization and Port Waste Management System significantly contribute to explaining Greenport Implementation.

Keywords: *Port Waste Management System (PWMS), Greenport, Ecoport, Greenport Implementation*

INTRODUCTION

Ecoport and Port Waste Management System (PWMS) are pivotal tools and strategies aimed at achieving sustainable goals within port management. Ecoport embodies a sustainability-driven approach, integrating economic, social, and environmental facets into decision-making processes and operational practices within ports. On the other hand, PWMS is a tailored waste management system devised to mitigate the adverse environmental impacts of waste generated at ports (Ferreira et al., 2020). This includes the comprehensive collection, segregation, and management of various waste streams, encompassing solid, liquid, and hazardous waste. The implementation of Ecoport and PWMS is instrumental in fostering Greenport practices, thereby contributing positively to environmental sustainability.

Ecoport initiatives offer multifaceted benefits, notably enhancing port operational efficiency and reducing the reliance on unsustainable natural resources. Through the adoption of eco-friendly technologies such as renewable energy sources and efficient water management systems, ports can significantly diminish their carbon footprint and mitigate other adverse environmental impacts. Moreover, the adoption of Ecoport and PWMS aligns port operations with international sustainability and environmental standards. One such significant standard is ISO 14001:2015 - Environmental Management Systems, which underscores the importance of effective and sustainable environmental management practices (Ong, T.S. et al., 2023). However, despite the evident benefits, the implementation of these strategies is not without its challenges. One of the primary challenges faced in implementing Ecoport and PWMS is the constraint of limited resources.

The establishment and maintenance of eco-friendly infrastructure and waste management systems require substantial financial investments, which may pose challenges, especially for smaller ports with limited budgets. Additionally, effective coordination between various agencies and stakeholders is crucial for the successful implementation of these strategies. This necessitates the development of strong partnerships and collaboration frameworks among port authorities, government agencies, and private stakeholders. Furthermore, raising awareness and garnering active participation from relevant stakeholders, including port workers, local communities, and environmental groups, are paramount for the successful implementation of Ecoport and PWMS initiatives. Ecoport and PWMS represent integral components of sustainable port management practices, offering a pathway towards achieving environmental sustainability goals.

While these strategies present significant benefits, addressing challenges such as limited resources, coordination, and stakeholder engagement is essential for their effective implementation. By overcoming these challenges, ports can enhance their environmental performance, comply with international standards, and contribute positively towards a greener and more sustainable future. In order to surmount the multifaceted challenges inherent in implementing sustainability initiatives within port environments, a concerted effort involving stakeholders from diverse sectors is indispensable. Collaboration among governmental bodies, port authorities, private enterprises, and local communities is imperative throughout the planning and execution phases.

The incorporation of stakeholders' perspectives and expertise enhances the efficacy and inclusivity of sustainability strategies, thereby facilitating their successful implementation. The integration of Ecoport initiatives and Port Waste Management Systems (PWMS) within the framework of Greenport implementation engenders a spectrum of consequential phenomena, each contributing to the advancement of environmental sustainability within port operations. These phenomena encompass:

1. **Augmented sustainability consciousness:** The deployment of Ecoports and PWMS fosters a heightened awareness of sustainable practices among port stakeholders. This phenomenon precipitates a collective recognition of the imperative to mitigate environmental impacts and enhance

resource efficiency within the port sector.

2. **Policy and regulatory evolution:** The adoption of Ecoport and PWMS initiatives may precipitate policy and regulatory adaptations at local, national, and international levels. This regulatory impetus compels ports to conform to established sustainability standards, thereby ensuring alignment with environmentally sound practices and robust waste management protocols.

3. **Mitigation of environmental ramifications:** Ecoport and PWMS endeavours are expressly designed to mitigate the adverse environmental repercussions associated with port activities. This encompasses enhancements in energy efficiency, the integration of renewable energy sources, optimised waste management practices, and the preservation of coastal ecosystems.

4. **Enhancement of community well-being:** The implementation of Ecoport and PWMS initiatives engenders tangible benefits for communities residing in the vicinity of ports. By curbing pollution levels and enhancing waste management protocols, these initiatives ameliorate air and water quality in the port environs, consequently fostering enhanced community health and quality of life.

5. **Fostering collaborative partnerships:** A pivotal facet of the Ecoport and PWMS paradigm is the cultivation of synergistic relationships among ports, governmental entities, local communities, and pertinent industry stakeholders. These initiatives advocate for the active involvement of all stakeholders in decision-making processes and the implementation of sustainable solutions, thereby fostering harmonious and mutually reinforcing relationships within the port ecosystem.

6. **Accrual of competitive advantage:** The implementation of Ecoport and PWMS initiatives confers a discernible competitive edge upon ports. Ports that embrace eco-friendly practices and institute effective waste management systems are positioned to attract environmentally conscious shipping companies, cargo handlers, and allied enterprises, thereby bolstering their market competitiveness and fostering long-term sustainability.

The collaborative engagement of stakeholders and the adoption of Ecoport and PWMS initiatives represent instrumental imperatives in surmounting the challenges associated with achieving sustainability objectives within port environments. By harnessing collective expertise and fostering inclusive partnerships, ports can navigate the complexities of sustainability implementation, thereby realising enhanced environmental stewardship and fostering resilience in the face of evolving regulatory landscapes and environmental exigencies.

The inadequacies in the maximization of the Ecoport socialization program and the proper implementation of the Port Waste Management System are evident, indicating a gap in the current approach to Greenport implementation. Furthermore, the review highlights a lack of stakeholder engagement, further hindering the effective implementation of Greenport initiatives. Additionally, inadequate supervision of the Port Waste Management System's implementation and limited human resources pose significant challenges to the successful execution of sustainable practices within the port environment.

This study seeks to address these gaps by examining the impact of the Ecoport Socialization Program on Greenport implementation at Tanjung Priok Port. Specifically, the research aims to determine the extent to which the Ecoport Socialization Program influences the adoption of green practices within the port. Additionally, the study seeks to analyse the effect of the Port Waste Management System on the implementation of Greenport at Tanjung Priok Port, assessing its role in reducing environmental impacts and improving waste management practices. Furthermore, the research aims to evaluate the

combined impact of the Ecoport Socialization Program and the Port Waste Management System on Greenport implementation, exploring synergies between these two initiatives in promoting sustainability within the port sector.

To achieve these objectives, the study will employ a mixed-methods approach, combining quantitative and qualitative data collection and analysis methods. Surveys will be conducted to gather quantitative data on stakeholders' perceptions of the Ecoport Socialization Program and the Port Waste Management System. Additionally, interviews and focus group discussions will be conducted to gain insights into stakeholders' experiences and perspectives regarding these initiatives. Document analysis will also be conducted to assess the effectiveness of the Ecoport Socialization Program and the Port Waste Management System in promoting Greenport implementation.

The findings of this study are expected to contribute to the existing body of knowledge on sustainable port management and green practices. By identifying the factors influencing the successful implementation of Greenport initiatives, the study aims to provide recommendations for enhancing the effectiveness of the Ecoport Socialization Program, the Port Waste Management System, and stakeholder engagement in promoting sustainability within the port sector. Ultimately, the research seeks to inform policy and practice in sustainable port management, with the aim of fostering a more environmentally friendly and socially responsible port industry.

METHOD

The research methodology employed in this study is descriptive in nature, utilizing a quantitative approach. Descriptive research involves the collection of data to test hypotheses or address questions concerning individuals' opinions on a specific issue or topic. Quantitative research, on the other hand, focuses on the analysis of numerical data using statistical methods (Banwell, E., Hanley, et al., 2022). Through quantitative methods, the study aims to ascertain the significance of the relationship between variables. Two primary data sources are utilized in this study: primary and secondary data sources. Primary data is obtained through interviews and questionnaires administered to officials, industry stakeholders, and service users at Tanjung Priok Port. Secondary data, on the other hand, is derived from related documents and literature, including policies and regulations pertaining to Ecoport and Port Waste Management System, as well as data from other ports for comparative analysis.

Observation is a fundamental human activity, involving the use of the senses, particularly sight, along with other senses such as hearing, smell, taste, and touch (Kurilla, 2023). In this study, observation is employed to assess the impact of the Ecoport socialization program and Port Waste Management System on Greenport implementation at Tanjung Priok Port. Interviews serve as the primary method for collecting qualitative data, providing insights into the perceptions and experiences of key stakeholders involved in the Ecoport program and waste management at the port. Interviews will be conducted with officials from PT Pelabuhan Indonesia II (Persero), the Environmental Agency, and waste management companies collaborating with PT Pelabuhan Indonesia II in waste management at the port.

Additionally, the documentary method is employed to supplement data collection, involving the capture of visual evidence during the research process. This documentation is typically conducted during interviews or data collection activities. The questionnaire, targeting industry players directly engaged in Greenport implementation at Tanjung Priok Port, including sea transportation entrepreneurs, port managers, shipping agents, and other relevant stakeholders, serves as a key tool for data collection and analysis. The research methodology employed in this study integrates both quantitative and qualitative approaches, utilizing a range of data collection methods to comprehensively assess the impact of the Ecoport socialization program and Port Waste Management System on Greenport implementation at Tanjung Priok Port.

RESULTS & DISCUSSION

Population is a generalization area

consisting of; objects / subjects that have certain qualities and characteristics set by researchers to study and then draw conclusions. (Islam, et al 2024). Population is also not just the number of objects / subjects studied, but includes all the characteristics possessed by the subject. all industry players operating at Tanjung Priok Port who are involved in the implementation of the *Greenport* program. The sample is part of the number and characteristics possessed by the population. If the population is large, and it is not possible for researchers to study everything in the population, for example due to limited funds, energy and time, then research can use samples taken from that population.

Because the population in this study was more than 100 people, the study used a simple random sampling method with the following formula:

$n/N = n'/N'$

where:

n = sample size required

N = total population

n' = sample size already taken

N' = total population already taken.

Using this formula, the required sample size can be calculated:

$n/N = n'/N'$ $n/384 = 30/384$ $n = 30 * 384 / 384$ $n = 30$ People

Environment caused by Maritime Business Activities in the Port. Analysis of the data shows variations in the ratings given by respondents to *Ecoport* socialization, reflected in a range of high (TS and KS), medium (S), to very low (SS) ratings. In the face of these assessments, an in-depth evaluation is needed to understand the factors that influenced respondents' perceptions, such as the effectiveness of communication, the approach used, or the adequacy of resources allocated. Such evaluations can be used as a basis for taking the necessary corrective actions. The frequency and percentage distribution results revealed through this research provide a deeper understanding of respondents' perceptions of Ecoport socialization in the context of activities within the port.

Table. 1 Frequency and Percentage Distribution Based on Ecoport Socialization (X1)

P	STS		TS		KS		S		SS		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
X1.1	0	0	1	5	9	45	5	25	5	25	20	100
X1.2	0	0	1	5	9	45	5	25	5	25	20	100
X1.3	0	0	0	0	9	45	6	30	5	25	20	100
X1.4	0	0	0	0	8	40	6	30	6	30	20	100
X1.5	0	0	0	0	9	45	6	30	5	25	20	100
X1.6	0	0	0	0	8	40	6	30	6	30	20	100
X1.7	0	0	0	0	9	45	6	30	5	25	20	100
X1.8	0	0	0	0	8	40	8	40	4	20	20	100
X1.9	0	0	0	0	7	35	7	35	6	30	20	100
X1.10	0	0	0	0	7	35	7	35	6	30	20	100

In the context of this study, there were variations in the ratings given by respondents to the port's waste management system. Some respondents gave high ratings (TS and KS), indicating satisfaction and recognition of the effectiveness and quality of the waste management system. Collaborative efforts between interested parties, such as the government, ports and the shipping industry, are needed to improve policies, infrastructure and procedures related to port waste management. Through the results of this

frequency and percentage distribution, aspects of *Greenport* implementation that need to be enhanced or improved can be identified. An in-depth evaluation of the factors that influence respondents' perceptions needs to be conducted, such as environmental awareness, regulatory support, adequate infrastructure, and stakeholder engagement. In this study, we used the structural equation modeling-partial least squares (SEM-PLS) data analysis method by utilizing SmartPLS software. Academic views related to the development of the SEM method have been presented by leading experts in this field. In conclusion, based on literature reviews conducted by various experts, it can be suggested that SEM-PLS is an efficient and flexible method for analyzing data with small sample sizes and complex models. (Sarstedt, et al 2024)

Ecoport Socialization (X1) and *Port Waste Management System (*X2) are able to explain *Greenport* Implementation (Y) by 59.6%, the remaining 40.4% is explained by other factors. *Port Waste Management System* (X2) has a positive and significant effect on *Greenport* Implementation (Y), with a coefficient value (Original Sample column) = 0.579 and P-Values = 0.000 <0.05 (Hypothesis Accepted). *Ecoport* socialization (X1) has a positive and significant effect on *Greenport* Implementation (Y), with a coefficient value (Original Sample column) = 0.455 and P-Values = 0.004 <0.05 (Hypothesis Accepted). It is known that the Q-Square (Q2) value of *Greenport* Implementation (Y) is 0.465> 0, which means that *Ecoport* Socialization (X1) and *Port Waste Management System* (X2) have predictive relevance to *Greenport* Implementation (Y).

Ecoport Socialization and *Port Waste Management System* From the results of the study, it appears that the socialization of Ecoport and Port Waste Management System has a significant contribution in explaining *Greenport* Implementation. Therefore, it is recommended to increase socialization efforts and understanding of these two aspects within the port environment. Focus on *Greenport* Implementation With 59.6% of *Greenport* *implementation* can be explained by *Ecoport* Socialization and *Port Waste Management*

System. This shows that *Greenport* implementation is important and needs more attention to achieve success and a greater impact on the environment. By Strengthening the *Port Waste Management System It* is known that the *Port Waste Management System has a* positive and significant effect on Greenport Implementation.

CONCLUSION

Ecoport Socialization and Port Waste Management System From the results of the study, it appears that the socialization of Ecoport and Port Waste Management System has a significant contribution in explaining Greenport Implementation. Therefore, it is recommended to increase socialization efforts and understanding of these two aspects within the port environment. Focus on Greenport Implementation With 59.6% of Greenport implementation can be explained by Ecoport Socialization and Port Waste Management System. This shows that Greenport implementation is important and needs more attention to achieve success and a greater impact on the environment. By Strengthening the Port Waste Management System It is known that the Port Waste Management System has a positive and significant effect on Greenport Implementation. Therefore, it is recommended to strengthen the waste management system at the port to increase its positive impact on Greenport. Increase Ecoport Socialization Ecoport socialization also has a positive and significant effect on Greenport Implementation. Increasing the level of socialization and understanding of Ecoport among port actors will help achieve better Greenport goals. Model Validation and Development The results of the Q-Square value show the predicted relevance of Ecoport Socialization and Port Waste Management System to Greenport Implementation. However, further validation and model development are still needed to ensure the accuracy and completeness of the analysis conducted.

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