The Role of English Proficiency in Promoting Green Shipping Technology: A Case Study of Indonesian Ports

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Abstract. The global shipping industry, which accounts for more than 80% of international trade, is under increasing pressure to implement sustainable practices to reduce environmental impact. Green shipping technology, such as low-emission fuels, digitalized logistics, and energy-efficient systems, is critical for lowering maritime pollution and greenhouse gas emissions. This study investigates the confluence of English language proficiency and the deployment of these technologies in Indonesian ports. English is the language franca in maritime operations, so good communication is critical for implementing advanced sustainable practices. Ports with proficient English-speaking personnel, such as Singapore and Rotterdam, show stronger incorporation of green technologies, emphasizing the value of language skills. The study underlines that increasing English proficiency among maritime personnel in Indonesia can increase the country's competitive-ness, operational efficiency, and compliance with international environmental norms. Finally, the findings call for targeted language training and investment in sustainable infrastructure to allow the effective transition into green ports and environmentally friendly maritime operations.

Keywords: Green Shipping, English Proficiency, Indonesian Ports.

1   Introduction

International commerce has integrated ports into its infrastructure as global trade and transportation have grown, transforming ports into hubs that manage not only cargo but also logistics, trade routes, and environmental protection at both local and global levels (Bergqvist & Monios, 2019). Despite efforts to adhere to environmental regulations, the shipping industry remains a significant contributor to greenhouse gas (GHG) emissions and air pollution. This has raised concerns about its role in climate change and its potential impacts on public health (Smith et al., 2014; WHO, 2016). The on-going reliance on fossil fuels in shipping and port operations underscores the urgent need for cleaner practices and stricter regulatory measures to mitigate these environmental and health risks.

Correspondingly, green ports and green shipping technology have been brought out as strategies focused on sustainable business in port operations and maritime transport. The concept of green ports goes side by side with reducing emissions through waste

management, energy efficiency, and pollution control technologies (Ng & Song, 2010; Lam & Notteboom, 2014). Along with this, green shipping technologies are also part of the current trends that help lower harmful emissions through mechanisms like the application of low-emission fuels, more advanced propulsion systems, and digital tools for logistics and supply chain operations.

Effective English language skills are essential for the maritime industry to successfully adopt and use green technologies. As the global lingua franca for communication in shipping and logistics, English enables maritime professionals to com-prehend technical and operational terms, facilitating clear communication essential for safety, regulatory compliance, and the seamless implementation of environmentally sustainable practices. This study focuses on how enhancing English proficiency among maritime professionals can support industry sustainability. Improved English skills allow professionals to better understand green shipping technologies and engage in logistics operations more effectively, ultimately contributing to the industry's sustainable development.

2   Literature Review

2.1   Green Shipping Technologies

The maritime industry is experiencing a growing demand for green shipping technologies as stakeholders recognize the urgent need to mitigate environmental impacts. Technologies such as scrubber systems, ballast water management (BWM), and LNG-fueled engines represent significant advancements that contribute to reducing greenhouse gas (GHG) emissions and enhancing sustainability. The International Maritime Organization (IMO) has set ambitious targets to reduce GHG emissions from international shipping by at least 20%–30% by 2030, compared to 2008 levels, and by at least 70%–80% by 2040 (IMO Strategy, 2023). These goals underscore the industry's commitment to sustainable practices, encouraging the adoption of innovative technologies to meet global environmental standards.

Green ports and green shipping technologies have become focal points for reducing emissions and promoting sustainable development in the maritime sector (Gill, 2023). Examples include the ports of Los Angeles and Rotterdam, which have successfully integrated renewable energy sources and adopted low-emission fuels like LNG and hydrogen (Bergqvist & Monios, 2019). Indonesia has also achieved tremendous progress through efforts like the Green Port idea, which aims to transform its ports into sustainable and smart centers by 2024 (Safuan, 2024).

2.2   The Role of English in Maritime Operations

English is used to deliver international regulation; likewise, the International Maritime Organization (IMO) talks about the standards of emission and regulation involved in environmental protection. Furthermore, English is not merely significant for technical and operational communication, but it is also of great help when it comes to digital tool interaction in the maritime logistics sector (Crystal, 2003). Consequently, the maritime

personnel must comprehend those standards and regulations in contributing to green shipping.

Empirical studies indicate that ports with high English proficiency, such as those in Singapore and Rotterdam, tend to integrate green practices more effectively than ports facing language barriers (Gill, 2023). In Indonesia, efforts are underway to enhance the English proficiency of maritime professionals to support the country's goal of creating environmentally friendly ports (Luhut, 2022). This approach not only aids in adopting international green standards but also fosters clearer communication with global partners, essential for implementing sustainable technologies and practices in the maritime sector.

Green shipping technologies are commonly introduced through documentation, manuals, and training materials in English. A strong understanding of English can significantly motivate maritime personnel to adopt these environmentally friendly technologies. This aligns with findings by Bergqvist & Monios (2019), which suggest that implementing new green methodologies often requires advanced technical English proficiency to effectively manage systems addressing environmental issues such as emission monitoring and energy management. Proper comprehension ensures that personnel can accurately follow guidelines, enhancing the successful integration of sustainable practices in the maritime industry.

2.3   Communication Challenges in Multicultural Maritime Context

The multicultural composition of maritime crews can result in communication barriers, not only due to language differences but also due to cultural diversity. In the realm of international trade with diverse languages, the mutual incomprehensibility of spoken languages may lead to communication and trust issues. Non-native language speakers' communication difficulties can lead to personnel issues and institutional blunders. Translation errors and misunderstandings can cause legal complications, affecting the organization both fiscally and in terms of customer satisfaction. (Onur Akarca, 2024).

2.4   Information Technology in Maritime Operations

With the adoption of advanced digital technologies in maritime operations, including automated systems and AI-driven decision-making tools, the need for technical English proficiency has grown. These systems often require users to understand complex technical commands in English, posing challenges for non-native speakers (Khan & Zhou, 2021).

3   Methodology

3.1   Type of Reseacrh

This study aims to examine the relationship between English language proficiency and the adoption of green shipping technologies in the maritime industry. By synthesizing

existing research, it highlights how language proficiency influences both the manner and the success of implementing environmentally sustainable technologies. Effective comprehension and communication in English are essential, as they enable maritime personnel to understand technical documentation, participate in training, and accurately implement guidelines related to green initiatives, thereby supporting the industry's shift toward sustainability.

3.2   Method of Collecting Data

The data were obtained through literature and relevant articles, papers, and reviews, which were collected from databases such as JSTOR, Scopus, Google Scholar, and other open-access sources. The search terms used included "green ports," "green shipping technologies," "maritime English," "English proficiency," "communication in the maritime industry," "multicultural crew management," and "technology adoption in shipping." In this study, the main data of the case study is from the green shipping technologies that are implemented in Port Teluk Lamong and Port Tanjung Priok.

3.3   Selection Criteria

Literature was selected based on the following criteria: articles published between 2010 and 2024 to ensure relevance and regency, and peer-reviewed articles or reputable reports focused on maritime environmental technologies and the role of English language proficiency.

4   Results and Discussion

4.1   Green Shipping Technologies: Implementation and Best Practices

The successful adoption of green shipping technologies is closely tied to the use of energy-efficient systems, renewable fuels, and smart port infrastructures. Ports like Rotterdam, Los Angeles, and Singapore have made significant strides in integrating sustainable practices into their operations, including the use of alternative fuels such as LNG and hydrogen, electrification of port equipment, and the implementation of digital monitoring systems (Bergqvist & Monios, 2019). As noted by Gill (2023), these advancements not only contribute to reducing the carbon footprint but also improve the overall efficiency and competitiveness of the ports.

Indonesia is making strides toward green port practices, emphasizing renewable energy, waste management, and digitalization. Ports such as Teluk Lamong and Tanjung Priok are adopting sustainable practices, positioning Indonesia as a leader in Southeast Asia's maritime sustainability efforts (Safuan, 2024). However, challenges remain due to a lack of standardized frameworks and limited infrastructure investment, which hinder the full realization of these green objectives (Indonesia Green Ports Initiative, 2024). Addressing these issues could strengthen Indonesia's role in global sustainable shipping.

The Deputy for Natural Resources and Services at the Coordinating Ministry for Maritime Affairs, Agung Kuswandono, reported that Teluk Lamong Port employs an advanced business model and IT systems, minimizing the need for human re-sources due to its high-tech operational framework (Harijanto, 2020). Additionally, Cris Kuntadi, the Minister's Expert Staff in Logistics, Multimodal, and Transportation Safety at the Ministry of Transportation, highlighted that Teluk Lamong serves as a reference point in environmental management. This port practices pollution prevention, water and energy conservation, and biodiversity protection, establishing it as Indonesia's first semi-automated green port. Teluk Lamong's sustainable infrastructure and processes make it a national model for green port development (Harijanto, 2020). The specifics of the green technology initiatives implemented at Teluk Lamong are detailed in Table 1.

Table 1. The Implementation of Green Shipping Technologies in Port Teluk Lamong and Tanjung Priok

Improvement/ Services	Teluk Lamong	Tanjung Priok
Source of Energy	Solar cell and gas usage, semi-automatic and electric system	Shore connection and onshore power supply
Smart Port	Greenerse, green wallet apps	Use case technology implementation supported by the National Logistics Ecosystem (NLE)
Garbage Management	Green wallet	Port Waste Management System (PWMS)

Fig. 1. The Port of Teluk Lamong, Surabaya, Indonesia. Source : Maharani 2019

Fig. 2. The Port of Tanjung Priok, Jakarta, Indonesia. Sumber : Pelindo (2024)

4.2   Role of English Language Proficiency in Green Shipping Technology

One of the significant challenges in advancing green practices within the maritime sector is English proficiency. As English serves as the global lingua franca in the shipping industry, it enables international collaboration, effective communication, and safety-based technical training, which are crucial for operational efficiency across multicultural maritime environments (Crystal, 2003). In particular, there is an increasing emphasis on English proficiency for comprehending complex technical manuals, adhering to safety protocols, and navigating digital interfaces essential for green port operations. This mastery of English is critical not only for large-scale international cooperation but also for more localized aspects of green technology adoption and operational consistency within the sector.

Ports in developed regions like Rotterdam and Singapore, for instance, exhibit higher use of green technologies in some part due to their workforce's language abilities. The success of these ports reflects an ethos of education for renewal and change, in which English is exploited not only to interact but also to teach the most advanced green technologies (Green Ports Initiative, 2024).

In brief, communicating effectively in English is crucial for mastering com-plex technical manuals, adhering to safety protocols, and ensuring clear communication on policies, waste management at sea, certification and training standards, inter-national agreements, environmental compliance, and audits, as well as accessing scientific publications and maritime journals. Additionally, English proficiency sup-ports navigating digital interfaces essential for green port operations, further under-scoring the essential role of language in the maritime sector's transition to sustainability.

4.3   Environmental and Socio-Economic Implications

Environmental Benefits: Green ports play a critical role in reducing greenhouse gas (GHG) emissions and improving air quality around port areas, thus helping to mitigate

marine pollution. As highlighted by Gill (2023), these initiatives are essential for promoting sustainability in port operations. For example, the Port of Los Angeles has introduced the Clean Air Action Plan (CAAP), which mandates a significant reduction in emissions from various sources, including ships, trucks, and cargo handling equipment. Specifically, the plan aims for an 85% reduction in nitrogen oxide (NOx) emissions and an 87% reduction in diesel particulate matter, which contributes to cleaner air and a healthier environment.

Green ports, as an aspect of social sustainability, will also result in increased employment generation and replace pollution-related jobs with those related to renewables and environmental management from a socio-economic standpoint. In Indonesia, the establishment of green ports could improve the global competitiveness of trade with efforts to cut logistical costs and apply environmentally friendly principles.

Socioeconomically speaking, green ports have the potential to create more jobs, particularly in the fields of environmental management and renewable energy. By lowering logistical costs and encouraging environmentally friendly practices, the establishment of green ports might help Indonesia become more competitive in the global trade arena. This could draw in foreign investments and partnerships (Safuan, 2024).

The use of English as the main language in training and operations within these green initiatives ensures that Indonesian ports can maintain alignment with global sustainability standards, such as those set by the International Maritime Organization (IMO) and other environmental bodies (Crystal, 2003). Improved English proficiency among maritime workers is essential for fostering these international collaborations and ensuring compliance with global standards.

4.4   Challenges in Green Port Transformation

Notwithstanding the advantages, several obstacles prevent green port technology from being widely used in developing nations. High implementation costs, the requirement for technology improvements, and port operators' low levels of digital literacy are a few of these (Indonesia Green Ports Initiative, 2024). Furthermore, these problems are made worse by regional differences in English ability, which makes it challenging for non-native speakers to participate meaningfully in international discussions about sustainable marine practices (Crystal, 2003).

The resistance to change in traditional port practices also plays a significant role in slowing down the transformation. Older port facilities may lack the flexibility to adopt new green technologies due to infrastructural constraints and a workforce that is unaccustomed to digital tools and technical jargon commonly communicated in English (Green Ports in Theory and Practice, Bergqvist & Monios, 2019).

4.5   Future Outlook and Strategic Recommendations

To address these issues, it is critical to emphasize the development of language training programs specific to the maritime industry. Initiatives should focus on strengthening

technical English skills so that marine personnel can better comprehend and implement green technologies (Crystal 2003). Furthermore, implementing worldwide best practices and standards will help developing nations like Indonesia achieve green and smart port status by 2024 (Luhut, 2022).

Strategic investments in infrastructure and technology are critical to this change. Encouraging public-private partnerships and collaborations with internation-al bodies can help mobilize the resources and expertise required to execute sustainable port operations. Furthermore, developing a legislative framework that incentivizes green projects while penalizing noncompliance can hasten the adoption of these technologies throughout the maritime sector.

5   Conclusion

English as the international standard language in the maritime industry enables global collaboration and understanding of the importance of environmentally friendly shipping. The combination of green shipping technologies with English language skills is critical to the marine industry's long-term future. Indonesia's initiatives to modernize its ports with digital and green capabilities reflect a larger trend toward global environmental responsibility. However, to fully realize the promise of these advances, it is critical to close the linguistic and technological gaps that currently impede the effective application of sustainable marine practices.

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