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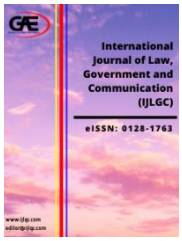

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VESSEL-SOURCED POLLUTION IN MALAYSIA: STRENGTHENING LEGAL FRAMEWORKS FOR CLIMATE ACTION AND MARINE SUSTAINABILITY

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Abstract:

Vessel-sourced pollution remains a significant environmental challenge for Malaysia, particularly in high-traffic maritime zones such as the Straits of Malacca and the South China Sea. Although Malaysia has ratified key international conventions, such as the MARPOL Convention and the United Nations Convention on the Law of the Sea (UNCLOS), enforcement remains inconsistent due to jurisdictional complexities within its federal legal system. Furthermore, climate change amplifies the environmental impact of vessel-sourced pollution, highlighting the urgent need for more robust legal and policy frameworks. This paper critically examines Malaysia's legal framework governing vessel-sourced pollution and assesses its effectiveness in addressing climate change while promoting marine sustainability. It analyses key legislation, such as the Environmental Quality Act 1974, the Merchant Shipping Ordinance 1952, the Merchant Shipping (Liability and Compensation for Oil and Bunker Oil Pollution) Act 1994, and the Exclusive Economic Zone Act 1984. Additionally, the paper considers international commitments, including MARPOL 73/78, UNCLOS 1982, and the regulatory framework established by the International Maritime Organization (IMO). The findings in the paper underline the critical need for Malaysia to strengthen the harmonisation of domestic and international laws while incorporating climate action into its legal and policy frameworks. By strengthening legal frameworks and promoting sustainable maritime practices, Malaysia can mitigate the environmental impacts of vessel-sourced pollution and contribute to global efforts in combating climate change and ensuring marine sustainability.

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Keywords:

Vessel-sourced Pollution, Climate Change, Marine Sustainability, Environmental Quality Act 1974, MARPOL, UNCLOS, IMO.

Introduction

The maritime industry plays a crucial role in global trade and economic development, with shipping accounting for approximately 80% of international trade volume (World Bank Group, 2024). Meanwhile, vessel-sourced pollution has emerged as a significant environmental challenge, contributing to marine degradation, air pollution, and climate change (Abdullah et al., 2024). This issue is significant in Malaysia due to its strategic location along major shipping routes, such as the Straits of Malacca, one of the busiest maritime zones globally. Vessel-sourced pollution contributes to broader environmental challenges like climate change. For example, greenhouse gas emissions from ships exacerbate global warming, while oil spills and chemical discharges degrade marine habitats and reduce their resilience to climate-related stressors (Hidalgo et al., 2022). However, the existing frameworks established by the law of the sea and the international climate change regime do not offer a comprehensive and clear set of rules for protecting and preserving the marine environment against the detrimental impacts of climate change (Klerk, 2023).

While Malaysia has ratified several international conventions aimed at mitigating vessel-sourced pollution, the effectiveness of their implementation remains a subject of scrutiny. Regulatory complexities, jurisdictional conflicts, and enforcement challenges hinder Malaysia's ability to fully comply with international standards and ensure marine sustainability (Mukhtar & Mustafa, 2012). Understanding the interplay between international obligations, national law and policies, and regional cooperation is essential in assessing Malaysia’s legal responses to vessel-sourced pollution. Addressing these environmental concerns is critical to ensuring marine sustainability and mitigating climate change impacts.

This paper examines Malaysia’s legal framework for vessel-sourced pollution in alignment with international maritime conventions. It analyses the intersection of vessel-sourced pollution, climate action and marine sustainability in Malaysia’s maritime sector. By analysing these dimensions, this study aims to contribute actionable insights toward fostering a more sustainable and resilient maritime future for Malaysia and the global community.

Literature Review

Vessel-sourced pollution, including oil spills and emissions, significantly impacts marine environments, causing harm to marine life, coastal ecosystems, and human health (Thahira et al., 2023; Dar, 2023; Abdullah et al., 2024). Common pollutants include oil and nitrogen dioxide (NO_2), originating from vessel operations and contributing to broader environmental issues like climate change (Abdullah et al., 2024). For instance, NO_2 emissions from ships have been identified as a major contributor to air pollution in maritime zones, exacerbating climate change effects (Abdullah et al., 2024). Studies highlighted how international climate commitments influence regulatory actions within the IMO, including its 2018 Initial Strategy, which aims to reduce shipping-related emissions by 40% by 2030 and achieve net-zero emissions by 2050 (Kerr, 2021; Serris et al., 2023).

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Several studies have explored vessel-sourced pollution and its environmental implications. Mukherjee and Xu (2015) examined the effectiveness of international legal frameworks in regulating ship-source pollution, while Karim (2015) analysed the IMO's role in preventing marine pollution. Technological advancements, such as renewable energy systems on vessels and energy management systems in seaports, have also been studied as potential solutions to reduce emissions (Serris et al., 2023; Zadeh et al., 2024). Moreover, Tiquio et al. (2017) compared pollution management frameworks between Southeast Asia and Europe, highlighting gaps in regulatory enforcement.

Narrowing our focus to Malaysia, a nation strategically positioned along one of the world's busiest shipping routes, the issue of vessel-sourced pollution takes on heightened urgency. High-traffic maritime regions such as the Straits of Malacca and Singapore have become focal points for environmental degradation due to oil discharges, greenhouse gas emissions, and ballast water contamination (bin Mohd Rusli, 2011; George et al., 2017). These pollutants harm marine biodiversity and undermine the socio-economic stability of coastal communities dependent on marine resources. The Straits of Malacca, a vital artery for international trade, face persistent environmental challenges exacerbated by insufficient enforcement mechanisms and gaps in regulatory frameworks (Mohd Zaideen & Ramli, 2024). Climate change further compounds these issues, intensifying the impacts of pollution on marine ecosystems and threatening their long-term sustainability (Idris et al., 2022). As Malaysia strives to balance economic development with environmental protection, addressing vessel-sourced pollution has become a critical policy imperative.

Moreover, studies specific to Malaysia, such as those by Rusli et al. (2021) and Tarigan et al. (2023), assessed Malaysia's compliance with international agreements and regional cooperation initiatives in the Straits of Malacca. Uddin and Karim (2018) examined the role of international conventions in regulating ship-source pollution, emphasising the importance of MARPOL and other liability regimes. Similarly, George et al. (2017) highlighted the potential of MARPOL Annex VI to reduce atmospheric emissions in shared maritime zones like the Straits of Malacca and Singapore. Additionally, jurisdictional uncertainties between federal and state governments complicate the enforcement of marine environmental laws in Malaysia (Mukhtar & Mustafa, 2012). Siti Hazwani Hanim (2024) highlights that "the Federal Constitution lacks measures on environmental conservation or pollution control, distinguishing it from the constitutions of numerous other countries".

While existing literature provides valuable insights into vessel-sourced pollution and maritime legal frameworks, gaps remain in understanding Malaysia's regulatory challenges within the context of climate change and marine sustainability. Past studies have highlighted the importance of regional cooperation and legal harmonisation in combating marine pollution (Sabila et al., 2022). Nevertheless, existing research often overlooks the specific legal and institutional challenges developing nations like Malaysia face in enforcing international standards effectively. This gap in the literature underscores the need for a better understanding of how national legal frameworks can be strengthened to address vessel-sourced pollution and broader climate-related threats.

Future policy developments should enhance the interaction between climate law and maritime law, ensuring that international legal frameworks remain adaptive to technological advancements and emerging sustainability challenges (Guo, 2023). These measures would

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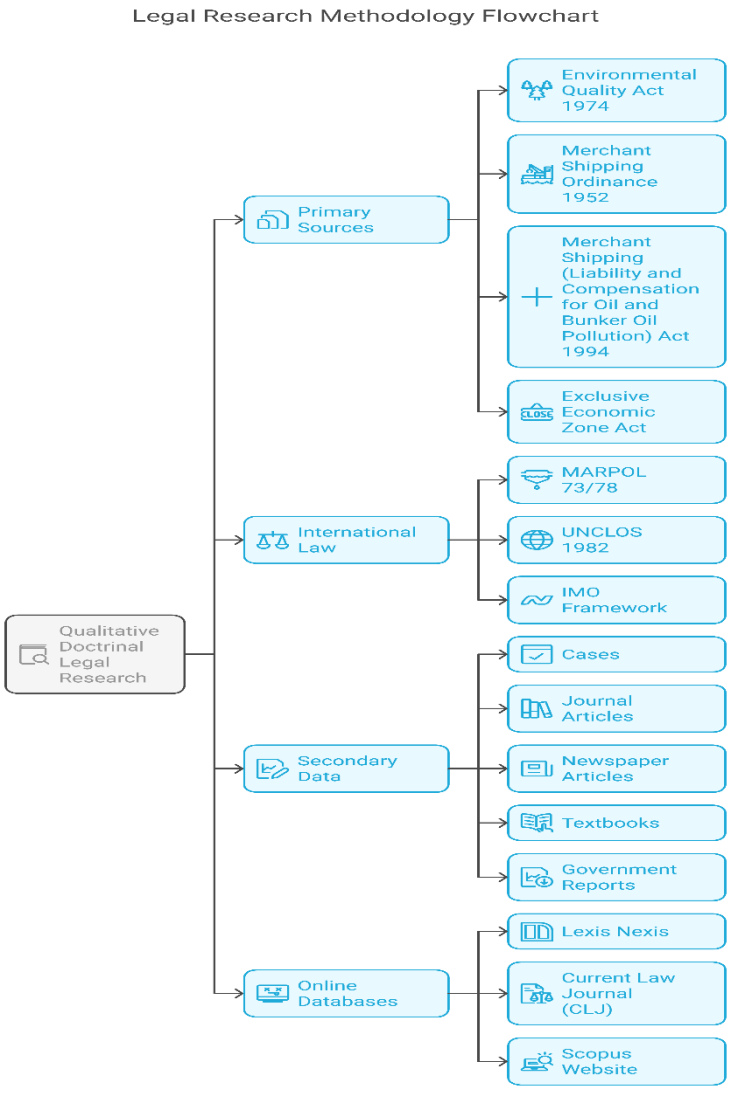
significantly enhance the effectiveness of international legal frameworks in mitigating vessel-sourced pollution while aligning the maritime sector with global sustainability objectives.

Methodology

This paper adopts qualitative doctrinal legal research to discuss it in depth and detail. For this purpose, the discussion adopts the doctrinal content analysis method by examining the primary sources such as the Environmental Quality Act 1974, the Merchant Shipping Ordinance 1952, the Merchant Shipping (Liability and Compensation for Oil and Bunker Oil Pollution) Act 1994 and the Exclusive Economic Zone Act. This paper also refers to international law such as MARPOL 73/78, UNCLOS 1982, and the regulatory framework established by the International Maritime Organization (IMO). The secondary data are collected from cases, journal articles, newspaper articles, textbooks, and government reports. In addition, online databases such as 'Lexis Nexis', 'Current Law Journal (CLJ)' and 'Scopus' website are used for this purpose. The research methodology employed in this study involved content analysis of primary data and literature reviews of secondary data to provide additional contextual support.



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Findings and Discussion

Strengthening Legal Framework for Climate Action and Marine Sustainability in Malaysia

National Legal Framework

Malaysia is a federal constitutional monarchy with a governance framework that divides powers between the federal and state governments. Article 74 of the Federal Constitution delineates legislative powers: "*Parliament may make laws with respect to any matters enumerated in the Federal List or Concurrent List in the Ninth Schedule*." This system allows for regulating various federal and state matters, ensuring that each government has authority over certain domains. However, it is significant that the Federal Constitution does not explicitly address 'pollution', 'marine pollution', or 'vessel-sourced pollution'. This absence is especially striking compared to other nations' constitutional frameworks that enshrine environmental rights and pollution control measures. Siti Hazwani Hanim (2024) aptly observes, "The Federal Constitution lacks measures on environmental conservation or pollution control, distinguishing it from the constitutions of numerous other countries." This statement underscores a notable gap in Malaysia's highest legal framework, especially given the growing global emphasis on environmental protection. Furthermore, Malaysia's federal legal structure presents enforcement challenges, as jurisdiction over marine pollution is divided between federal and state authorities (Mukhtar & Mustafa, 2012). These complexities necessitate a comprehensive evaluation of Malaysia's legal framework in addressing vessel-sourced pollution and promoting marine sustainability.

Despite this absence, Malaysia's legal system still provides a robust framework for environmental governance, including controlling marine pollution, through various specific legislations. These legal instruments are the primary tools for addressing pollution and environmental degradation, offering a detailed regulatory approach compensating for the lack of explicit constitutional provisions. For example, the Environmental Quality Act (EQA) 1974 remains the cornerstone of Malaysia's environmental protection efforts, encompassing a broad range of pollution control measures across air, water, and land. The Merchant Shipping Ordinance 1952 regulates pollution from ships and vessels, addressing concerns such as oil spills, hazardous waste, and other vessel-sourced contaminants in Malaysian waters. Additionally, the Exclusive Economic Zone Act 1984 regulates activities within Malaysia's exclusive economic zone, including marine pollution prevention and the conservation of marine biodiversity.

Below is a table explaining the Malaysian legal framework governing vessel-sourced pollution. It focuses on the Environmental Quality Act 1974, Merchant Shipping Ordinance 1952, Merchant Shipping (Liability and Compensation for Oil and Bunker Oil Pollution) Act 1994, and Exclusive Economic Zone Act 1984 (EEZ Act). The table highlights the relevant sections and challenges to climate action and marine sustainability.

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Table 1: National Legal Framework Governing Vessel-Sourced Pollution in Malaysia

Legislation	Relevant Sections	Challenges to Climate Action and Marine Sustainability
Environmental Quality Act 1974 (EQA) (EQA 1974)	Section 27 – Prohibits oil and waste discharge into Malaysian waters. Section 29- Prohibition of discharge of wastes into Malaysian water.	The EQA contains only two provisions directly addressing marine pollution, which is inadequate for effectively regulating the modern threats of marine pollution. -The territorial application of the Act is limited to the geographical area known as "Malaysian water", which mainly refers to the territorial waters of Malaysia (Section 2, Environmental Quality Act, 1974; Siti Hazwani Hanim Ramli, 2024). -Jurisdictional complexities due to the federal-state division of powers (Mukhtar & Mustafa, 2012). -The existing laws do not demonstrate a direct correlation with climate change. (Maizatun Mustafa, 2020).
Merchant Shipping Ordinance 1952	Section 306CA – Prohibits the discharge of oil or harmful substances.	Part VA of the Merchant Shipping Ordinance addresses marine pollution. However, it is unclear whether it aligns with any international conventions on marine pollution, particularly MARPOL 73/78, to which Malaysia is a party. (Siti Hazwani Hanim Ramli, 2024).
Merchant Shipping (Liability and Compensation for Oil and Bunker Oil Pollution) Act 1994	Section 5- Liability for oil pollution- The owner of a ship at the time of an incident, or where the incident consists of a series of occurrences, at the time of the first occurrence, shall, except as otherwise provided for by this Act, be liable for any pollution damage caused by the ship as a result of the incident in the area of Malaysia.	This Act has effectively filled the gaps in the territorial application of the EQA 1974 and the Merchant Shipping Ordinance 1952, which are limited to Malaysia's territorial waters (Siti Hazwani Hanim Ramli, 2024). The Merchant Shipping (Oil Pollution) Act limits the use of one pollutant (oil) and one source (vessel).
Exclusive Economic Zone Act 1984 (EEZ Act)	Section 9: Malaysia has the sovereign right to exploit its natural resources in the exclusive economic zone under	The EEZ Act addresses various pollutants and sources, including land-based, offshore installations, atmospheric emissions, and waste

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	its environmental policies and by its duty to protect and preserve the marine environment in the zone.	dumping (Section 2 Exclusive Economic Zone Act 1984). Transboundary pollution complicates enforcement in shared waters like the Straits of Malacca (Tarigan et al., 2023; Idris et al., 2022).

Source: Reorganize from Environmental Quality Act 1974 (EQA), Merchant Shipping Ordinance 1952, Merchant Shipping (Liability and Compensation for Oil and Bunker Oil Pollution) Act 1994 and Exclusive Economic Zone.

International Legal Framework

Below is a table explaining Malaysia's International legal commitments governing vessel-sourced pollution. It focuses on MARPOL 73/78, the United Nations Convention on the Law of the Sea (UNCLOS) 1982, and the International Maritime Organization (IMO). The table highlights their descriptions and provisions related to vessel-sourced pollution and addressing climate action and marine sustainability.

Table 2: International Legal Commitments in Malaysia

International Convention	Description	Provisions related to Vessel-Sourced Pollution	Addressing Climate Action and Marine Sustainability
MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships)	-Malaysia ratified it to set global standards for preventing oil spills, air pollution, and hazardous waste discharge from ships.	- Annex I & II: Prevents oil spills and noxious liquid discharges. - Annex IV & V: Regulates sewage & garbage from ships. - Annex VI: Controls air pollution from ship emissions.	- It aims to reduce greenhouse gas emissions and improve energy efficiency in the shipping industry (Uddin & Karim, 2018; Mathew & Kumar, 2024). -Introduces measures like the Energy Efficiency Design Index (EEDI) and Ship Energy Efficiency Management Plan (SEEMP) to reduce carbon emissions. (Hansen et al., 2020)
United Nations Convention on the Law of the Sea (UNCLOS) 1982	-Establishes Malaysia's rights and responsibilities in protecting the marine environment, including the obligation to prevent marine pollution.	- Part XII: Article 192: States have the obligation to protect and preserve the marine environment. - Article 194: Measures to prevent, reduce and control pollution of the marine environment. - Article 207: Pollution from land-based sources	-Part XII has not been effectively utilised to regulate climate change because its definition of pollution does not explicitly include greenhouse gas emissions (Conrad C. et al., 2024). -The United Nations Convention on the Law of the Sea (UNCLOS) does not explicitly address climate change but provides a

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		- Article 211: Pollution from vessels. - Article 212: Pollution from or through the atmosphere.	comprehensive legal framework governing the seas and oceans. This framework gives rise to rights and obligations that are significantly influenced by and pertinent to the impacts of climate change (Jiménez Pineda, E., 2025)
International Maritime Organization (IMO)	-The IMO is a specialised agency of the United Nations responsible for regulating shipping. It develops global standards to prevent marine pollution and promote sustainable maritime practices.	-The International Maritime Organization (IMO) has established several key provisions and conventions to address vessel-sourced pollution. These provisions aim to regulate pollution from ships, including oil spills, air emissions, ballast water discharge, and garbage, while addressing broader environmental concerns such as climate change.	-The IMO adopted the Initial Strategy on Reduction of GHG Emissions from Ships in 2018. This strategy aims to reduce total annual GHG emissions from international shipping by at least 50% by 2050 compared to 2008. This strategy aligns with global efforts to combat climate change under the Paris Agreement (Hidalgo et al., 2022).

Source: Reorganize from MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships), United Nations Convention on the Law of the Sea (UNCLOS) 1982 and International Maritime Organization (IMO).

Climate Action and Marine Sustainability: The Challenges

Addressing vessel-sourced pollution within the climate action and marine sustainability framework presents considerable challenges for Malaysia. Climate change exacerbates the necessity for sustainable practices in maritime operations, thereby complicating these efforts. While Malaysia has ratified key international agreements, including the MARPOL Convention, it is important to assess how the provisions of international law regarding the protection of the marine environment in the straits are integrated into domestic regulations. Strengthening enforcement mechanisms and enhancing intergovernmental coordination are essential to overcoming the obstacles that hinder progress toward marine sustainability.

Moreover, achieving marine sustainability requires addressing transboundary pollution through regional and international cooperation. Vessel-sourced pollution does not respect national borders, making collaboration essential for effective management. While Malaysia has engaged in regional agreements, such as the tripartite agreement with Indonesia and Singapore to protect the Straits of Malacca, legally binding mechanisms are often lacking (Tarigan et al., 2023). Strengthening these agreements and adopting models similar to those in the European Union could enhance the effectiveness of pollution management in Southeast Asia (Tiquio et

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al., 2017). Continuous research and development of decision support systems for managing oil spills and other pollutants can further improve response strategies, protecting sensitive coastal areas. Overcoming these challenges will require sustained commitment, innovation, and collaboration at both national and global levels.

Conclusion

In conclusion, managing vessel-sourced pollution in Malaysia represents a significant environmental and regulatory challenge, particularly in light of climate change and the need for marine sustainability. To enhance the effectiveness of pollution control, it is essential to strengthen national regulatory frameworks, improve enforcement mechanisms, and promote regional collaboration. Malaysia can further benefit from integrating best practices from other jurisdictions, such as the legally binding environmental agreements established by the European Union. Additionally, fostering greater stakeholder engagement through collaboration among government agencies, industry representatives, and civil society is critical to achieving long-term sustainability. Malaysia can advance marine environmental governance within Southeast Asia by emphasising legal reforms and implementing sustainable policies.

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