



A Comparative Analysis of Coral Reef Protection Frameworks in Malaysia and Australia

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ABSTRACT. Coral reefs provide critical ecological and socio-economic benefits but are increasingly threatened by climate change, pollution, coastal development and unsustainable marine activities. This study comparatively examines the legal and policy frameworks governing coral reef protection in Malaysia and Australia and evaluates how differences in legal design and governance influence their implementation. Using doctrinal legal research and a structured comparative approach, the study analyses primary legal and policy instruments and relevant secondary literature across seven dimensions: legislative framework, institutional coordination, enforcement mechanisms, marine spatial planning and protected-area management, stakeholder participation, adaptive governance and climate responsiveness, and implementation of international obligations. The findings demonstrate that both jurisdictions possess substantial legal and policy mechanisms for marine conservation but differ significantly in the degree to which these mechanisms are integrated and implemented. Australia's Great Barrier Reef framework demonstrates comparatively stronger institutional coordination, zoning and spatial planning, scientific monitoring, stakeholder participation and adaptive management. Malaysia has important legislative foundations, particularly through the Fisheries Act 1985 and Environmental Quality Act 1974, but implementation is constrained by dispersed institutional responsibilities, federal–state coordination challenges and enforcement limitations. Nevertheless, Australia continues to face significant pressures from climate change and land-based pollution, demonstrating the limitations of even advanced governance arrangements. The study concludes that Malaysia could strengthen coral reef governance by improving federal–state institutional coordination, progressively integrating marine spatial planning into marine park management, enhancing enforcement and monitoring capacity, and developing more systematic science-based adaptive management.

Keywords: Comparative law, Environmental policy, Marine conservation, Malaysia and Australia

1. INTRODUCTION

Coral reefs perform critical ecological and socio-economic functions. They support marine biodiversity, protect coastlines from erosion and storms, sustain fisheries and contribute substantially to tourism. These functions make effective legal protection essential, particularly as reefs face increasing pressure from pollution, overfishing, coastal development and climate change (Bartelet et al., 2023; Chomariyah, 2025; Souter et al., 2021). Legal protection can be supported through targeted instruments, including fisheries legislation, environmental protection laws and marine park regulations. These legal instruments establish protected areas, enforce compliance against threats like overfishing and pollution, and integrate adaptive strategies informed by international obligations under legal frameworks (Marzo et al., 2023; Nurhidayah, 2018; Pramudianto et al., 2022). However, despite their ecological and economic significance, these intricate ecosystems are increasingly imperiled by anthropogenic factors, necessitating a nuanced understanding of how national legal and policy instruments support or constrain effective coral reef protection. In Malaysia, for instance, the existing legal framework for coral reef conservation, particularly in tourism

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areas, is often deemed insufficient, with statutes like the Fisheries Act 1985 lacking explicit emphasis on coral reef protection and specific guidelines for mitigating tourism impacts (Azman et al., 2011). This legislative lacuna, combined with overlapping jurisdictional responsibilities between federal and state governments in a federal system, as exemplified by marine parks in Terengganu, further complicates effective enforcement and comprehensive management strategies for marine protected areas (Safuan et al., 2022). Conversely, Australia presents a more integrated approach, particularly evident in the Great Barrier Reef's comprehensive management plan, which heavily relies on scientific data and periodic reviews to adapt to dynamic ecological changes (Ben-Romdhane et al., 2020). This divergence in legislative robustness and administrative coherence between the two nations underscores the critical need for a comparative analysis to identify best practices and areas requiring reform in coral reef governance.

Although existing scholarship has examined marine conservation, marine protected areas and coral reef governance in Malaysia and Australia, much of the literature addresses the two jurisdictions separately or concentrates on particular instruments, institutions or ecological challenges. Limited attention has been given to a systematic comparative legal analysis that evaluates both jurisdictions using common governance criteria and distinguishes between the formal legal framework and its practical implementation. In particular, there remains a need to examine how differences in legislative design, institutional coordination, enforcement, marine spatial planning, stakeholder participation, adaptive governance and implementation of international obligations affect coral reef protection in the two jurisdictions. This study addresses that gap through a structured doctrinal and comparative analysis and identifies context-sensitive lessons that may inform the development of Malaysia's coral reef governance framework.

Accordingly, this study addresses the following research questions: RQ1: What are the principal legal and policy frameworks governing coral reef protection in Malaysia and Australia? RQ2: How do the two jurisdictions compare in terms of legislative framework, institutional coordination, enforcement mechanisms, marine spatial planning and protected-area management, stakeholder participation, adaptive governance and climate responsiveness, and implementation of international obligations? RQ3: What context-appropriate lessons from the Australian framework may inform the strengthening of coral reef governance in Malaysia?

2. LITERATURE REVIEW

Existing scholarship on coral reef protection in Malaysia consistently identifies weaknesses not in the complete absence of environmental legislation, but in the implementation, coordination and enforcement of existing legal frameworks. Studies examining the Fisheries Act 1985 and Environmental Quality Act 1974 have highlighted inadequate penalties, enforcement limitations and overlapping federal–state responsibilities as persistent obstacles to effective marine protected-area management (Ramli et al., 2011; Fidelman et al., 2011; Huang, 2025). These concerns are reinforced by studies focusing on tourism impacts and marine governance, which similarly identify fragmented administration, jurisdictional overlap and weaknesses in implementation as major constraints on coral reef protection in Malaysia (Azman et al., 2011; Rahman et al., 2019; Safuan et al., 2022). Taken together, the Malaysian literature suggests that the principal governance problem is not simply legislative insufficiency, but the difficulty of translating existing legal protection into coordinated and effective implementation.

Australian scholarship presents a different but not entirely unproblematic picture. Studies generally emphasise the comparatively developed institutional and regulatory framework surrounding the Great Barrier Reef, particularly the use of marine park authorities, zoning, permit systems, ecosystem-based management and adaptive governance (Wong et al., 2023; Phillips et al., 2023; Vella et al., 2025). Research also highlights the role of scientific monitoring, periodic review and institutional adaptation in Great Barrier Reef management (Ben-Romdhane et al., 2020; Day, 2022). However, this literature does not portray the Australian framework as fully effective. Continuing problems, particularly catchment pollution and other external pressures, demonstrate that sophisticated legal and institutional arrangements do not necessarily eliminate implementation challenges. Thus, the Australian literature suggests that stronger regulatory integration and adaptive management improve governance capacity, but they remain constrained by environmental pressures extending beyond the direct reach of marine park regulation.

Regional scholarship further demonstrates that the gap between formal legal commitments and practical implementation is not unique to Malaysia. Studies of Indonesia and the Philippines show that even where international obligations, marine protected areas and fisheries legislation are formally recognised, enforcement difficulties, illegal fishing and weaknesses in local implementation continue to reduce conservation effectiveness (Andriesse, 2018; Anugrah et al., 2020; Nurhidayah, 2018; Widayanti et al., 2022). At the regional level, the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security promotes more harmonised and ecosystem-based management, yet disparities in national implementation remain evident (Heck, 2022; Schuttenberg, 2023). Similarly, studies concerning Southeast Asian environmental governance indicate that ecosystem-services approaches and ASEAN soft-law mechanisms offer useful frameworks but remain incomplete in balancing conservation objectives with economic activities and community livelihoods (Chomariyah, 2025; Ong et al., 2016; Pramudianto et al., 2022). Collectively, these studies reinforce the importance of examining not merely whether conservation laws exist, but how effectively they are implemented within different institutional and socio-economic contexts.

Despite this substantial body of literature, several limitations remain. First, much of the existing scholarship examines individual jurisdictions, particular statutes or specific conservation challenges rather than applying a common analytical framework to Malaysia and Australia. Second, there remains limited comparative examination of the relationship between *de jure* legal protection and *de facto* implementation, particularly across dimensions such as institutional coordination, enforcement, marine spatial planning and adaptive governance. Third, existing research has not sufficiently explored how lessons derived from a more developed reef-governance system may be adapted to a developing-country context without assuming that institutional models can simply be transferred from one jurisdiction to another (Comte & Pendleton, 2018; Ismail & Goeden, 2022).

Accordingly, the present study addresses these gaps through a structured comparative analysis of Malaysia and Australia. Rather than merely describing the legislation of each country, the study examines how the two systems differ in terms of legislative coherence, institutional coordination, enforcement, marine spatial planning, stakeholder participation, adaptive governance and implementation of international obligations. This approach enables the study

to identify not only differences in legal design, but also the extent to which those differences affect implementation and the practical effectiveness of coral reef protection.

3. METHODOLOGY

This study employs a doctrinal legal research approach, combined with comparative analysis, to scrutinize the legal and policy frameworks governing coral reef protection in Malaysia and Australia, drawing upon primary legal instruments and secondary scholarly interpretations (Dudayev et al., 2025). This approach involves a meticulous examination of statutory provisions, national policies, and relevant case law to delineate the *de jure* landscape of marine conservation in both jurisdictions. Specifically, it utilizes a statutory approach to interpret concepts related to maritime policy and coastal resource management in both a federal system, as seen in Malaysia, and a more centralized system, characteristic of Australia (Nasrullah et al., 2021). The methodological framework also incorporates a conceptual approach to analyze underlying legal principles and theoretical constructs informing coral reef protection, alongside a case approach to investigate real-world applications and enforcement challenges within their distinct governance contexts (Kumalasari, 2024; Zein et al., 2023). This approach enables comparison of legislative objectives, policy implementation and enforcement in the two jurisdictions, enabling the identification of convergences and divergences in legislative intent, policy implementation, and enforcement efficacy between the two nations.

The comparative analysis adopts a structured functional approach. Rather than comparing legislation solely by title or institutional form, the study examines how the respective legal and policy frameworks perform comparable coral reef governance functions. Seven analytical dimensions are applied consistently to both jurisdictions: (1) legislative framework; (2) institutional arrangements and coordination; (3) enforcement mechanisms; (4) marine spatial planning and protected-area management; (5) stakeholder participation; (6) adaptive governance and climate responsiveness; and (7) implementation of international obligations. Each dimension is assessed first at the *de jure* level by examining the relevant statutory and policy framework and subsequently at the *de facto* level through secondary literature, institutional reports and documented implementation experience. The findings are then compared to identify convergence, divergence, implementation gaps and potentially transferable governance practices.

Primary materials were selected on the basis of their direct regulatory relevance to coral reefs, marine protected areas, fisheries, marine pollution, environmental assessment, spatial regulation and reef-specific management. For Malaysia, the analysis focuses principally on the Fisheries Act 1985, Environmental Quality Act 1974, relevant marine park regulations and national marine and environmental policies. For Australia, the principal instruments examined include the Great Barrier Reef Marine Park Act 1975, Environment Protection and Biodiversity Conservation Act 1999, relevant zoning and regulatory instruments, and the Reef 2050 Long-Term Sustainability Plan. Relevant judicial or administrative materials are considered where they illuminate the interpretation, implementation or enforcement of these instruments. Secondary academic literature and institutional reports are used to assess implementation and the gap between formal law and practice.

The analysis proceeded in four stages. First, the principal statutes, regulations, policies and institutional instruments governing coral reef and marine conservation were identified for each jurisdiction. Second, each instrument was examined doctrinally to identify relevant regulatory powers, responsibilities, prohibitions, planning mechanisms and enforcement arrangements. Third, the extracted legal material was organised according to the seven predefined comparative criteria. Secondary academic and institutional sources were then used to assess documented implementation and enforcement experience. Fourth, findings from Malaysia and Australia were compared criterion-by-criterion to identify similarities, differences, de jure–de facto gaps and governance practices potentially relevant to Malaysia. The same analytical categories were applied to both jurisdictions to maintain consistency and transparency.

4. RESULTS

The findings are organised according to the principal comparative dimensions used in this study: (1) legislative framework, (2) institutional arrangements and coordination, (3) enforcement mechanisms, (4) marine spatial planning and protected-area management, (5) stakeholder participation, (6) adaptive governance and climate responsiveness, and (7) international obligations and broader implementation context. This structure enables the two jurisdictions to be compared systematically rather than examined through separate descriptive accounts.

4.1. Legislative Framework

Malaysia and Australia both possess legal frameworks capable of contributing to coral reef protection, but the structure and degree of integration of these frameworks differ. In Malaysia, the principal legal measures examined include the Fisheries Act 1985 and the Environmental Quality Act 1974. The Fisheries Act provides mechanisms relevant to the prohibition of destructive fishing practices and the establishment and management of marine protected areas, while the Environmental Quality Act addresses pollution and environmental impacts. However, the effectiveness of these legal measures has been affected by weaknesses in enforcement, institutional overlap and federal–state jurisdictional complexities (Azman et al., 2011; Rahman et al., 2019; Ramli et al., 2011; Safuan et al., 2022).

Australia's framework, particularly in relation to the Great Barrier Reef, is comparatively more specialised. The Great Barrier Reef Marine Park Act 1975 provides the legal foundation for zoning, permitting and management of activities within the Great Barrier Reef Marine Park. These statutory arrangements are complemented by the Reef 2050 Long-Term Sustainability Plan, which incorporates scientific review, management strategies and measures relating to protected and no-take areas (Ben-Romdhane et al., 2020; Day, 2022; Vella et al., 2025).

The Australian framework is further supported by the Environment Protection and Biodiversity Conservation Act 1999, which provides a national mechanism for environmental assessment and the protection of matters of national environmental significance, including listed marine species and World Heritage areas such as the Great Barrier Reef (Miller et al., 2018). State and territory legislation additionally regulates matters including coastal development, fisheries and marine pollution. Accordingly, the principal legislative distinction identified is not the presence or

absence of environmental legislation in either jurisdiction. Rather, the Australian framework demonstrates a comparatively stronger integration between reef-specific legislation, national environmental legislation and long-term management policy, whereas Malaysian coral reef protection is distributed across several sectoral legal instruments. Previous studies similarly identify important differences in governance structure and the ability of the respective systems to respond to ecological and institutional pressures (Dunning, 2018; Garmestani et al., 2013).

4.2. Institutional Arrangements and Coordination

The two jurisdictions also differ significantly in the institutional structures through which their legal frameworks are implemented. In Malaysia, responsibilities relevant to coral reef conservation are distributed among several institutions at federal and state levels, including the Department of Fisheries and the Department of Environment. This institutional distribution can create coordination difficulties, particularly where marine conservation, pollution control, fisheries management and development activities involve different authorities. Such fragmentation may impede the development of unified responses to complex threats such as marine pollution and climate-related impacts (Davies et al., 2020).

The Australian Great Barrier Reef framework provides a more identifiable institutional focal point. The Great Barrier Reef Marine Park Authority, established under the Great Barrier Reef Marine Park Act 1975, is responsible for key aspects of planning, management and protection of the Great Barrier Reef. Its functions include implementing zoning arrangements, administering permits and conducting monitoring activities (Turner et al., 2016). The difference, therefore, should not be understood simply as one between a federal Malaysian system and a centralised Australian system. Both jurisdictions involve multiple governmental levels and institutions. The more significant distinction identified by the analysis is the degree of institutional integration around reef governance. Australia's Great Barrier Reef framework provides a dedicated institutional structure through which management functions can be coordinated, whereas Malaysian responsibilities remain more dispersed.

This difference is also evident in resource mobilisation and governance participation. Australian reef governance has benefited from significant financial commitments, including the A\$443 million allocation to the Great Barrier Reef Foundation, together with advisory input from researchers, industry representatives and other actors (Datta et al., 2023). Such multi-actor arrangements reflect a polycentric governance model capable of operating across institutional levels, although the long-term resilience of this system remains under increasing environmental pressure (Garmestani et al., 2013; Morrison, 2017). Malaysia, in comparison, continues to face challenges in coordinating the work of different departments and reconciling economic development objectives with conservation priorities. These institutional difficulties may contribute to policy inconsistencies and enforcement gaps (Li & Ning, 2025; Zhou, 2025).

4.3. Enforcement and Implementation Mechanisms

The comparative findings indicate that differences between Malaysia and Australia arise not only from legislative design, but also from the mechanisms through which legal requirements are implemented. Malaysia has established

legal mechanisms for fisheries management, environmental regulation and marine protection. Nevertheless, enforcement limitations, administrative overlap and coordination difficulties may reduce the practical effect of these protections (Azman et al., 2011; Rahman et al., 2019; Ramli et al., 2011; Safuan et al., 2022). In the Australian Great Barrier Reef context, statutory requirements are accompanied by more institutionalized operational mechanisms, including zoning, permits, monitoring and strategic environmental assessment. For example, the Australian federal government has instituted the Environment Protection and Biodiversity Conservation Act 1999 to undertake strategic assessments in high-growth coastal areas. Such assessments allow ecological risks associated with development to be considered at a broader planning level rather than relying exclusively on reactive, project-specific environmental impact assessment (Daniell & Kay, 2017).

The practical significance of this difference is that Australian legal provisions are connected more directly with mechanisms governing where activities may occur, which activities require permission, and how ecological impacts are monitored. This does not mean that Australian enforcement is uniformly successful. Rather, the findings indicate that the Great Barrier Reef framework contains a wider range of operational mechanisms connecting legal rules with implementation. Evidence from fisheries management and strategic rezoning also indicates that these governance mechanisms have produced observable ecological benefits, particularly for fish populations in protected areas (Evans et al., 2014). However, sophisticated implementation mechanisms require substantial institutional and scientific capacity. Effective spatial planning therefore depends upon continued investment in scientific research, compliance systems and monitoring mechanisms (McCay & Jones, 2011).

4.4. Marine Spatial Planning and Protected-Area Management

Marine spatial planning represents one of the clearest areas of difference between the two systems. The Great Barrier Reef Marine Park has developed an extensive zoning framework that regulates different categories of human activity within the marine environment. The zoning system, which has evolved considerably since its earlier implementation, demonstrates how marine spatial planning may be used to restrict threatening activities while simultaneously regulating permissible uses of marine resources (Day et al., 2019). The use of no-take zones provides a particularly important implementation example. Research indicates that protected zones within the Great Barrier Reef Marine Park have generated benefits for targeted fish species and broader ecosystem health, illustrating the potential effectiveness of spatial protection when supported by monitoring and enforcement (McCook et al., 2010).

The Australian experience consequently demonstrates that marine spatial planning can function as more than a formal designation of protected areas. It can provide a systematic mechanism for allocating uses, differentiating permissible and prohibited activities, protecting ecologically significant areas and adapting management measures as ecological information changes. This integrated approach has been influential internationally and has contributed to the development of marine spatial planning approaches elsewhere (Aziz et al., 2021; Stokes et al., 2014). Nevertheless, the findings also demonstrate the limitations of spatial management. Even a sophisticated zoning framework cannot fully control ecological threats originating outside protected marine boundaries. The Great Barrier Reef continues to experience difficulties in reducing diffuse land-based pollutants, including sediments, nutrients and pesticides

originating from agricultural catchments, and existing initiatives have struggled to meet water-quality objectives (Kroon et al., 2016; Tan & Humphries, 2018).

This illustrates an important limitation of marine protected areas: effective zoning within marine boundaries may be insufficient where ecological pressures originate from upstream terrestrial activities or involve several regulatory sectors. Such challenges highlight the importance of inter-sectoral governance in achieving conservation outcomes (Flannery et al., 2016). By comparison, Malaysia's marine conservation system includes marine protected areas, but the findings indicate greater difficulties in integrating ecosystem-based management and spatial planning across different sectors and governmental levels. The comparative difference therefore concerns not simply the existence of protected areas, but the degree to which spatial management is systematically integrated into the wider governance framework.

4.5. Stakeholder Participation

Stakeholder participation represents another distinction between the two governance systems. Australia's Great Barrier Reef governance framework incorporates consultation and participation by researchers, industry representatives and other stakeholders. Financial and institutional arrangements surrounding Great Barrier Reef management demonstrate the involvement of actors beyond government agencies alone (Datta et al., 2023). Australia has also developed consultative processes intended to strengthen public acceptance of conservation measures and awareness of the vulnerability of the Great Barrier Reef. In Malaysia, by contrast, difficulties remain in generating comparable levels of public participation and conservation awareness (Lebel et al., 2006). The significance of stakeholder involvement extends beyond consultation. Participation can facilitate the exchange of scientific and local knowledge, improve public understanding of conservation measures and strengthen support for management interventions. However, effective stakeholder participation requires institutional and financial capacity.

This requirement is particularly relevant in developing-country contexts, where the implementation of large-scale adaptive management and participatory governance may be constrained by financial, logistical and institutional limitations (Evans et al., 2011). The findings therefore indicate that Australia's comparatively structured participatory arrangements are associated with a broader governance framework involving government institutions, scientific actors and other stakeholders. Malaysia's governance framework, although evolving, appears to face greater challenges in institutionalizing stakeholder engagement as a consistent component of reef management.

4.6. Adaptive Governance and Climate Responsiveness

Both Malaysia and Australia face severe ecological pressures that cannot be addressed exclusively through conventional regulatory controls. Climate change, coral bleaching and other anthropogenic pressures require legal and institutional frameworks capable of adapting to changing ecological conditions (Marzo et al., 2023; Tan & Fischer, 2022). Australia's Great Barrier Reef framework demonstrates comparatively well-developed adaptive governance mechanisms, although these mechanisms have not eliminated the threats confronting the reef. Climate change continues to impose substantial pressure on the Great Barrier Reef, requiring continuing adaptation of legal and

institutional arrangements (Aravind, 2023).

An important feature of the Australian framework is the use of scientific research to inform management adjustment. The Great Barrier Reef management system has historically drawn on research initiatives, including Collaborative Research Centres, to address ecosystem-wide threats. The rezoning of the Great Barrier Reef Marine Park illustrates how governance arrangements have been modified in response to changing ecological knowledge and management requirements (Olsson et al., 2008). Adaptive governance is further reflected in the Reef 2050 Long-Term Sustainability Plan, which incorporates governance and long-term planning responses in the context of climate pressures, including widespread coral bleaching and extreme heat events (Morrison et al., 2020; Vella et al., 2025).

This institutional ability to incorporate scientific information, review existing management approaches and adjust governance mechanisms is an important characteristic of the Australian system. The broader adaptive governance model has demonstrated the capacity to respond to complex social-ecological change and has produced positive outcomes for aspects of natural capital management (Lane & Robinson, 2009; Schultz et al., 2015). Malaysia also recognises the importance of sustainable fisheries and marine conservation. However, the findings indicate continuing difficulties in integrating ecosystem-based management principles across different sectors and agencies. Large-scale adaptive governance and stakeholder participation may also be constrained by financial, institutional and logistical limitations (Evans et al., 2011). The comparative finding is therefore not that Australia has successfully resolved climate-related threats. Rather, Australia has developed more institutionalised mechanisms for monitoring, scientific review and management adjustment, while Malaysia's adaptive arrangements remain comparatively fragmented. Importantly, the persistence of climate-related pressures in Australia demonstrates that even advanced governance frameworks have limited ability to control global environmental drivers.

4.7. International Obligations and Broader Governance Context

The comparison also demonstrates the importance of situating domestic coral reef protection within the broader environmental governance context. In Australia, the Environment Protection and Biodiversity Conservation Act 1999 provides protection for matters of national environmental significance, including World Heritage areas such as the Great Barrier Reef (Miller et al., 2018). The Great Barrier Reef's international significance has therefore been incorporated into a wider national environmental protection framework.

However, the materials analysed in this study provide more extensive evidence concerning domestic legislation, institutional arrangements, enforcement, spatial planning and adaptive management than they do concerning the implementation of specific international conventions in domestic law in both jurisdictions. Accordingly, the present findings do not support a broader conclusion that either jurisdiction necessarily performs better in implementing all international coral reef obligations.

Instead, the comparative evidence demonstrates that the practical effectiveness of conservation commitments ultimately depends on the domestic institutions and governance mechanisms through which they are implemented. In this respect, the Australian Great Barrier Reef framework illustrates stronger integration among dedicated

administration, spatial planning, scientific monitoring and adaptive management, while Malaysia continues to face greater challenges involving institutional fragmentation, inter-agency coordination and implementation.

4.8. Overall Comparative Findings

Taken together, the findings demonstrate that the principal difference between Malaysia and Australia does not arise simply from the number of environmental statutes or conservation policies adopted by either country. Both jurisdictions possess substantial legal and policy mechanisms for marine conservation. The more significant distinction concerns the degree to which those legal instruments are translated into an integrated governance system.

In the Great Barrier Reef context, Australia combines reef-specific legislation, a dedicated management authority, zoning and permitting systems, scientific monitoring, strategic assessment, stakeholder participation and adaptive management. These mechanisms provide stronger institutional links between legal objectives and implementation. However, Australia's framework remains subject to significant limitations, particularly in addressing climate change and diffuse land-based pollution. Malaysia possesses important legislative foundations for marine conservation, particularly through fisheries and environmental legislation, but implementation is affected by dispersed institutional responsibilities, federal–state coordination challenges, enforcement limitations and difficulties in integrating ecosystem-based management.

The comparison therefore indicates that Australia's relative strength lies not in the existence of legislation alone, but in the integration of legislation, institutions, implementation mechanisms, scientific knowledge, spatial planning and stakeholder participation. At the same time, the continuing ecological pressures affecting the Great Barrier Reef demonstrate that even highly developed governance arrangements cannot independently resolve global climate pressures or complex land–sea interactions.

5. DISCUSSION

The findings demonstrate that the effectiveness of coral reef protection depends not only on the existence of legislation, but also on how legal rules are coordinated, implemented and enforced. This is particularly important in marine governance, where conservation objectives must be balanced with fisheries, tourism, coastal development and other ocean uses. The comparison therefore highlights the gap between *de jure* legal protection and *de facto* implementation in both jurisdictions (Aziz et al., 2019; Dineshbabu et al., 2019).

Australia has developed a relatively mature marine conservation framework, supported by an extensive network of marine protected areas and the long-standing governance of the Great Barrier Reef Marine Park (Jensen et al., 2025; Libecap, 2024). This has contributed to more developed legislative and institutional arrangements for marine ecosystem management (Grorud-Colvert et al., 2021). The Great Barrier Reef Marine Park Authority also provides a clearer institutional focal point for planning, management and enforcement, demonstrating the value of dedicated and coordinated governance structures (Gao et al., 2024; Tian, 2025).

However, the Australian framework should not be treated as a perfect or purely centralised model. Australia itself

faces coordination difficulties arising from federalism, including challenges in aligning regulatory bodies and managing offshore jurisdictional issues (Singh et al., 2021; Kriwoken, 2023). This suggests that the main difference between the two countries is not federalism itself, but the degree to which marine governance functions are coordinated within their respective federal systems.

For Malaysia, the principal challenge is therefore not simply the absence of legislation, but the fragmentation of implementation responsibilities and limitations in enforcement capacity. Although Malaysia has established marine protected areas, supervisory limitations and resource constraints may weaken practical enforcement (Marzo et al., 2023). Federal–state divisions of authority also complicate the development of integrated marine spatial planning and may hinder coherent ocean governance (Salimun et al., 2026). These jurisdictional complexities can produce less integrated conservation outcomes when compared with Australia's more developed spatial planning arrangements (Cockerell et al., 2020; Grech et al., 2014).

Among the Australian practices examined, marine spatial planning and institutional coordination provide the most relevant lessons for Malaysia. Marine spatial planning can help coordinate competing ocean uses, identify sensitive areas and connect conservation decisions with fisheries, tourism and coastal development (Lua & Aziz, 2025). Malaysia could therefore strengthen coordination among existing federal and state institutions and progressively integrate clearer zoning and spatial planning into marine park management, rather than attempting to replicate Australian institutions directly.

Biodiversity offsetting may also provide a supplementary policy lesson. Australian approaches in Queensland and New South Wales demonstrate attempts to institutionalise mitigation through centralised financial contributions and restoration measures (Niner & Randalls, 2021), including objectives such as “no net loss” or equivalent environmental outcomes (Niner et al., 2021). However, the effectiveness of marine biodiversity offsetting remains uncertain because of the difficulty of reproducing complex marine habitats and managing overlapping uses (Niner et al., 2017). For this reason, biodiversity offsetting should not be treated as the principal reform strategy for Malaysia, but rather as a possible supplementary instrument within a broader framework of avoidance, mitigation, enforcement and spatial planning.

Overall, the comparison indicates that Malaysia would benefit more from strengthening institutional coordination, enforcement capacity and marine spatial planning than from simply adopting additional legislation. The Australian experience offers useful governance lessons, but these must be adapted to Malaysia's constitutional structure, administrative capacity and existing legal framework rather than transplanted directly.

6. CONCLUSION

This study finds that the principal differences between Malaysia and Australia arise across legislative coherence, institutional coordination, enforcement, spatial management, stakeholder participation and adaptive governance. Australia provides a comparatively more integrated operational framework for Great Barrier Reef management

through dedicated institutional arrangements, zoning, permitting, scientific monitoring and adaptive planning, although substantial challenges remain, particularly in relation to climate change and land-based pollution. Malaysia possesses important legal foundations for marine conservation, but stronger coordination, implementation, monitoring and spatial planning are required to convert these formal protections into more consistent conservation outcomes. Future reform should therefore prioritise improved integration of existing laws and institutions rather than relying on any single policy instrument. Biodiversity offsetting may warrant further investigation as a supplementary policy tool, but it is not treated as a principal recommendation of this study. The Australian experience suggests five principal lessons of relevance to Malaysia: stronger coordination among institutions with reef-related responsibilities; more systematic use of marine spatial planning and zoning; closer integration of scientific monitoring with periodic management review; clearer implementation and compliance mechanisms; and more structured stakeholder participation. These practices should not be transplanted mechanically. Their adoption would need to reflect Malaysia's federal–state division of powers, existing departmental responsibilities, resource capacity and local socio-economic conditions.

The appropriate objective is therefore not replication of the Australian model, but adaptation of governance functions that can strengthen coherence, accountability and responsiveness within Malaysia's existing legal system. The Australian model, despite its challenges in federal coordination and achieving consistent policy outcomes, demonstrates a more deliberate progression towards formalized mechanisms for mitigating developmental impacts on marine ecosystems (Bell-James, 2016). In contrast, Malaysia's less integrated approach to marine spatial planning and its nascent engagement with biodiversity offsetting present significant opportunities for policy development and the strengthening of regulatory frameworks to achieve more robust coral reef conservation outcomes (Kambey et al., 2025). Future research should critically evaluate the long-term ecological efficacy of Australia's marine biodiversity offsetting programs, particularly regarding their capacity to achieve genuine "no net loss" of complex coral reef ecosystems.

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AUTHOR CONTRIBUTIONS

Nur Azlina Mohamad Zahari conceptualised the study, supervised the research and contributed to the writing and critical revision of the manuscript. Nurul Fatin Shuhada Mohamad Falik and Hannah Eami Noramin were responsible for data collection, legal analysis and drafting the initial manuscript. Alya Sabrina Mohammed Hafiz and Nureen Sabrina Rusdi Aziz contributed to the literature review, comparative analysis and data interpretation. Dian Zulaikha Daud and Amrel Ashadiq Azizi assisted in methodology development and manuscript editing. Lily Syamimi Suhaidi Hanimi and Nur Dania Aqilah Firdauz contributed to proofreading, formatting and final review of the manuscript. All authors have read and approved the final version of the manuscript.

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ChatGPT and QuillBot were used to improve language clarity and writing quality. The authors reviewed the revised text and take responsibility for the final manuscript.

DATA AVAILABILITY

The data are available from the corresponding author upon reasonable request.

COMPETING INTEREST

The authors declare that there are no competing interests.

COMPLIANCE OF ETHICAL STANDARDS

Not applicable.

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Not applicable.

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