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The legal and socioeconomic challenges for environmental protection in marine policy and the silk route maritime

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Introduction: The intersection of legal frameworks and socioeconomic interests poses a significant challenge to ocean policy focused on environmental protection. This article examines the complexities of international regulation, national interests, and local needs. Legal frameworks like the United Nations Convention on the Law of the Sea provide a foundation for sustainable use and environmental protection. However, the implementation of these frameworks varies significantly around the world. Socioeconomic disparities and their impact on governance and resource management further undermine resource utilization and contribute to environmental degradation. The research compares and contrasts the environmental laws of various countries and examines the laws of nations under the United Nations' global governance.

Methods: This paper's research approach adopts a literature review with secondary data from official databases, such as UNCLOS, the United Nations, and other official databases. We also utilize the consequences of recently published papers in high-impact publishers such as Frontiers, Oxford University Press, Springer, Elsevier, IEEE, Wiley, Taylor & Francis, and MDPI. For cross-border cooperation, there are possibilities and pitfalls of harmonizing monitoring and enforcement of policy.

Results: It has six tables and three figures that provide statistics reflecting global performance in marine and environmental law, designed to protect the world.

Discussion: Therefore, the Belt and Road Initiative and the China-Pakistan Economic Corridor must tackle these issues through collaborative efforts that engage coastal governance participation. Effective ocean governance within these frameworks can encourage regional cooperation, ensuring legal commitments align with socioeconomic realities. Ultimately, it is crucial to maintain a balance that supports marine conservation and sustainable development. Adaptive management strategies and institutional collaboration are needed to pursue these complexities, develop sustainability and resilience in marine ecosystems, and inform more effective environmental protection policies.

KEYWORDS

marine policy, environmental protection, law, global governance, BRI, socioeconomic, United Nations, CPEC

1 Introduction

Marine environments are the focal point of worldwide sustainability but are ever more vulnerable to human activities and climate change. As a mechanism for environmental protection, marine policy grapples with legitimate legal and socioeconomic interests. Legitimate regimes are often stretched in enforcement and balancing transboundary interests, while socioeconomic factors like resource dependence and stakeholder competition hinder effective governing (Khan and Chang, 2022). This research examines these interrelated challenges in the context of demands for harmonious policies that bring together environmental aims and equitable development. The paper explores these intricacies and attempts to contribute more robust, sustainable ocean governance systems to achieve long-term economic and environmental benefits. The paper emphasizes the need for strong legal frameworks that promote economic development with environmental factors for viability. It aims to provide insight into effective policy-making, balancing environmental purity and socioeconomic progress in oceanic conditions. Marine policies are fundamental to fostering such economic growth without much environmental loss. This implies that sustainable development strategies regarding the regulation of marine resources must be integrated into the law. In addition, the emphasis and linkage on the meaning of China's and Pakistan's associated land-use transformation concerning the Belt and Road Initiative's maritime policy are remarkable (Huang et al., 2024). How effectively are current international and national legal regimes addressing environmental protection within the context of marine policy, focusing on the Chinese Belt and Road Initiative? What are the key socioeconomic barriers to implementing sustainable marine environmental policy, and how do they intersect with the governance of BRI participant nations?

The China-Pakistan Economic Corridor, beyond environmental sustainability concerns, also reflects how infrastructural growth leads to changes (Waheed et al., 2024). One also sees the same in China's policy of balancing increased trade with imposed sea regulations to guarantee environmental balance, such as with the Shanghai Free Commerce Zone and Hainan's Free Trade Port HFTP policy. Sri Lanka's port development has regional-scale impacts on the local environment and trade. Through active interventions in their economic growth, China can help BRI countries with the necessary expertise to develop viable marine policies that contribute towards sustainability (Djunarsjah and Handayani, 2021). China has persistently posted impressive growth in GDP both domestically and internationally (Zhang, 2024; Suroso et al., n.d). This would also consider the relevant international laws and regulations, such as the United Nations Convention on the Law of the Sea (UNCLOS), providing an agenda for sustainable marine use practices (Khng, 2024). Therefore, it tries to respond to the urgent call for balanced approaches that could promote economic growth while ensuring marine environment protection and social equity by analyzing the impacts of such policies in developing countries'

participation in debates on sustainable development (Long et al., 2023).

The People's Republic of China's Belt and Road Initiative aims to build a connectivity network between Central Asia, the Middle East, Europe, and Africa by coordinating land and maritime routes for regional development, enhanced trade, and economic growth. The name was coined in 2013 by China's President Xi Jinping, drawing his inspiration from the concept of the Silk Road (Anshori et al., 2024), established during the Han Dynasty 2,000 years ago (Xia, 2024). The ancient maritime and overland trade routes (2nd century BCE–14th century CE) between Europe and China, through which goods, ideas, and culture were exchanged. The 21st-century Maritime Silk Road connects modern to ancient maritime routes such as ports (Piraeus, Gwadar), railroads, and digital highways and routes based on monsoon-season winds (Zhou et al., 2024). The oceanic element is intended to foster world shipping efficiency and Chinese geopolitical influence, focusing on port development, shipping lanes, and coastal economic belts. China's Belt and Road Initiative (BRI, formerly OBOR) is a modern international development initiative involving infrastructure investment, trade relations, and economic cooperation across countries to enhance interconnectivity and Chinese geopolitical influence (Zhou et al., 2024).

The rapid infrastructural development of BRI frequently involves large purchases of land, leading to dire legal problems in striving for a balance between social and environmental sustainability and economic growth; regional government systems (Shen et al., 2024), cultural issues, and environmental effects are the drivers that influence these changes (Huang, 2015). The vast infrastructure project aimed to connect various parts of several continents by income group (Hong and Guan, 2024), classified according to the World Bank classification. It is based on land, sea, and marine policy, as well as according to BRI (Khan et al., 2022).

Over 200 BRI cooperation agreements have been signed with Pakistan, Russia, Kazakhstan, Egypt, Indonesia, Kenya, more than 140+ countries, and 30 international organizations (Wang, n.d). These are only prime examples of many settings where such characteristics are present, as shown in the formation (Highlighted in Figure 1). The CPEC has drastically changed the land usage pattern in Pakistan and caused environmental degradation, thus accounting for several relocations. At the same time, it is a practical way to achieve the UN's Sustainable Development Goals, including establishing regional and international policies on sustainable development (Mujtaba et al., 2024). There is an essential window of opportunity to broaden studies on their legal and socioeconomic dimensions for marine conservation. Significant research gaps remain in understanding marine protection's legal and socioeconomic challenges (Nadeem et al., 2025). While existing studies provide early indications, further studies could deepen analyses of how these initiatives align with international maritime law (Li and Khan, 2024), bolster environmental regulation enforcement, and enhance transboundary ecological cooperation. Priorities for research areas are examining coastal community resilience,



FIGURE 1

Describes the main research tasks and knowledge foundation: The model presented in this study was developed through the authors' original innovation, explicitly focusing on addressing key tasks and knowledge gaps in marine policy.

mainstreaming climate adaptation in maritime policies, and encouraging corporate responsibility in sustainability strategy (Simon and Muñoz, n.d). Future research could also concentrate on long-term ecological monitoring, new green finance mechanisms, and regional collaboration to facilitate sustainable maritime development under the BRI and CPEC frameworks (Waheed et al., 2025).

2 Materials and methods

This study is based on a critical analytic approach, in which the researcher's judgment and values are highlighted. The study is centered on both factual and deserving aspects. A descriptive research design was engaged to respond systematically and accurately to the issues. Data for this research were gathered through an extensive review of the materials available, such as prior research studies, documents, reports, books, and other relevant sources, such as the official database of the UN and World Bank (Garlock, n.d). The secondary sources included published research articles like Elsevier, Springer, Oxford Publisher and Frontiers. These periodicals and peer-reviewed articles are presented in online databases such as JCR, JSTOR, official repositories, documents, and Google Scholar, which were obtained from newspapers and other media (Holzheid et al., 2024). The study scrutinized bilateral treaties, memoranda of understanding, joint statements, and high-level visit agreements between countries (Song and Fabinyi, 2022).

Additionally, marine policy, legislative, and global legal practices were analyzed to enhance the regulatory environment (Figure 2). Land transformation implications regarding managing marine resources and sustainability were investigated to demonstrate the consequences of infrastructural development on aquatic life. The study also evaluates international legislation and regulations, such as the UN Convention on the Law of the Sea, that impact national policy and practice in ocean resource management (United Nations Treaty Collection, n.d). These recommendations seek to enhance legal regimes so that the use of marine resources is environmentally sustainable, equitable, and responsive to the requirements of the ecosystem and local human societies; their assessment adds to broader attempts to achieve sustainability and effective environmental management through participation in regional discussions of sustainable development, sea policy, and environmental rule-making (Li and Khan, 2022).

3 Synthesis of conceptual approaches

A literature review is an evaluative expression of previous work, and the integration of legal frameworks and socioeconomic factors presents serious challenges to environmental protection in maritime policy, particularly under the Belt and Road Initiative. The coordination of international law, the United Nations Convention on the Law of the Sea (UNCLOS), with domestic policy is required to address diverse environmental concerns. The BRI emphasizes infrastructure construction but neglects the ecological dimension,

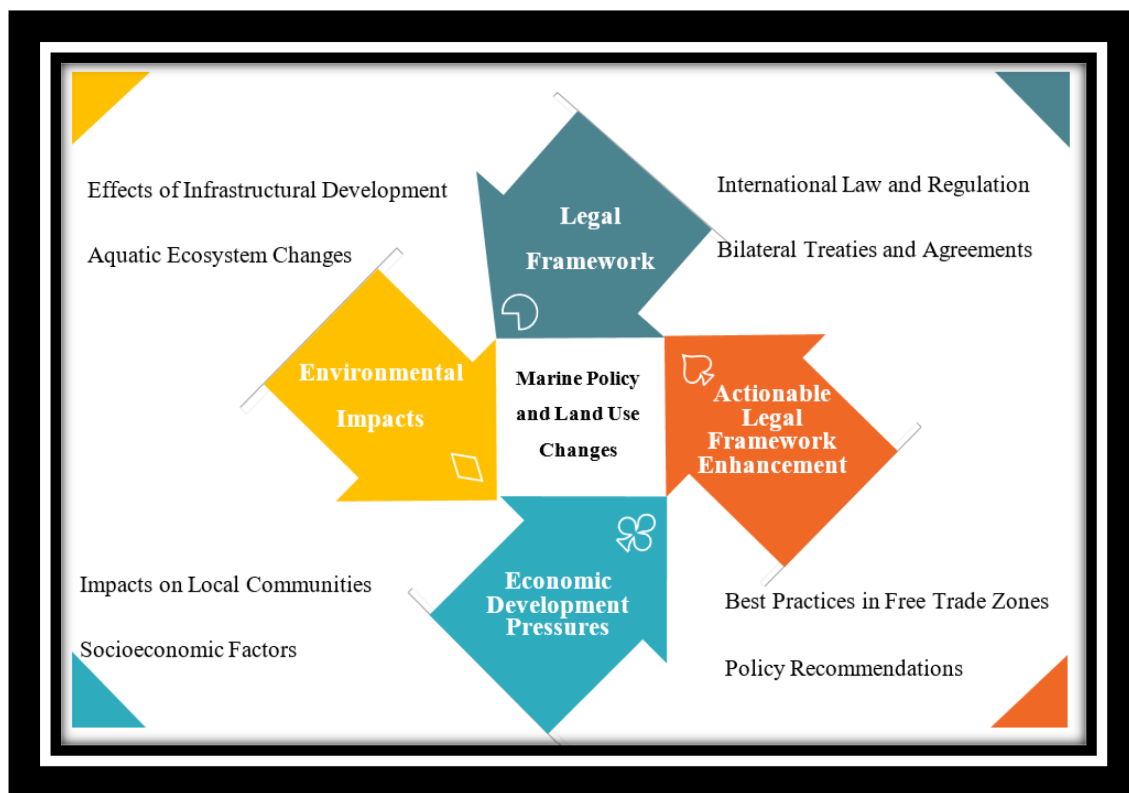


FIGURE 2

The study emphasizes the research approach and highlights the principal elements of the investigation. This exploration design analyses marine policy and global cooperation in four principal dimensions: international agreements, economic growth, legal/regulatory systems, and environmental sustainability.

leading to the potential degradation of marine ecosystems. Besides, socioeconomic disparities among BRI countries complicate the enforcement of environmental regulations. Countries with poor resources are most likely unable to implement sustainable approaches, resulting in asymmetry in compliance. Cross-border cooperation can be fostered through collaborative governance mechanisms and innovative digital technologies in monitoring and enforcement. This review suggests the imperative of marrying legal, environmental, as well as socioeconomic considerations to develop a firm marine policy that safeguards marine biodiversity as well as promotes sustainable economic progress (Wang et al., 2024).

3.1 Environmental protection

Marine ecosystems are a critical component of global sustainability, but marine ecosystems encounter enormous pressures from human activity, climate change, and economic needs. Environmental protection concerns in marine policy are generally embedded in the legal framework, socioeconomic needs, and stakeholder relationships. International agreements are complicated for legal systems to enforce, and problem-solving across borders (Boothroyd et al., 2024) is daunting, whilst effective governance is compromised by resource dependency and stakeholder conflict. The research answers these interconnected

challenges by demanding harmonious policies balancing environmental goals and equitable development (Table 1) and provides a concise overview of international environmental protection laws. There is a date, subject, source, and references for every entry for the sake of clarity and authenticity. The information is drawn from universally accepted legal frameworks and policies. Dealing with such complexities, the research highlights the need to harmonize legal requirements with socio-economic realities for sustainable marine conservation outcomes (Bryce and Hunter, 2024).

3.2 Legal contexts in marine policy

Legal institutions in marine policy form the basis of sustainable ocean governance. There is a package of international agreements that gives instructions on boundary, resource management, and environmental protection; for example, the most commonly known one is UNCLOS, which, according to such writers, has a fundamental role in striking a balance between various national interest and international efforts for marine conservation (Rothwell and Stephens, 2023). In recent years, the development of laws in China, such as the Fisheries Law and the Maritime Environmental Protection Law (Yang et al., 2025), has significantly impacted maritime policy. The laws enhance the protection of marine ecosystems and encourage

TABLE 1 The global environmental protection laws in different regions.

Domain	Origin	Indications
International Environmental Law Organization, Convention on the Law of the Sea, and the Law Against the Depletion of Resources.	IELCO 1973	https://www.ciel.org/WorldResourcesInstitute,InternationalEnvironmentalLawOrganizationhttps://www.fao.org/4/y5924e/y5924e06.htm
China Eighteen key areas of environmental protection law are in Chapter 7.	The Chinese National Council 2015	http://www.mee.gov.cn/ https://www.chinalawtranslate.com/
United States Clean Air Act The National Environmental Policy Act.	Department of Justice 1963 to 1990	https://www.law.cornell.edu/uscode/text/42/chapter-85
India Environmental Protection Act, Part III, Section 3.	Indian Government Rules 1986	https://cpcb.nic.in/7thEditionPollutionControlLawSeries2021.pdf https://www.indiacode.nic.in/bitstream/123456789/4316/1/ep_act_1986.pdf
Australia Water Pollution Act.	Australian Government 2008–2009	https://www.dcceew.gov.au/water/policy/policy/water-laws
United States Clean Water and Pollution Act 43	USA1972	https://www.epa.gov/laws-regulations/summary-clean-water-act
United Kingdom Climate and Sustainability Strategy, Part 4. The National Green Deal.	British government 2018 to 2019	https://www.ukri.org/wp-content/uploads/2020/10/UKRI-050920-SustainabilityStrategy.pdf

The resource for table information has been collated from different countries' official databases, including references and links for every country on the bench.

sustainable fishing practices. Research indicates adaptive governance contributes to marine policy (O'Leary et al., 2012). A flexible legal framework that can accommodate the evolving needs and circumstances of stakeholders and the environment over time. Still, many critical research gaps exist regarding maritime policy in Pakistan and Sri Lanka (Li, 2023). Establishing and enforcing effective legal mechanisms for resource management and marine conservation is challenging for both countries (Nijamdeen et al., 2020; Ullah et al., 2021). Moreover, Pakistan's legislation sometimes lacks comprehensive enforcement methods, while Sri Lanka still faces challenges in engaging the local population in decision-making processes (Aslam et al., 2023).

Furthermore, it is increasingly realized that integrating local government systems through customary law is essential for an active management approach to marine resources. A sustainable marine strategy needs a practical legal framework reflecting the regional and global perspective by considering China's adopted policies and filling in the gaps in Sri Lanka and Pakistan. For instance, the UNCLOS Provide essential frameworks for the sustainable management of marine resources. At the same time, regional programs by the Asian Development Bank and the World Bank enable environmental sustainability through financing and technical assistance. However, policy unevenness in implementation across various countries might discourage effective management. The BRI prioritizes green financing to harmonize economic development with environmental sustainability. In response to these advances, however, integrating digital technologies into tracking compliance is a challenge that necessitates new solutions to policy design. Encouraging international cooperation and taking advantage of technological innovation is essential to meet these challenges and preserve marine ecosystems

while advancing the economic interests of the Silk Route countries (Satria et al., 2024).

3.3 Research gap

Few studies discuss the intersection of legal systems and socioeconomic determinants in conserving marine environments. Such gaps are the effectiveness of international law at the local level, equity in the allocation of resources, enforcement challenges, and the socioeconomic impact of conservation policy among coastal communities, particularly in developing nations (Tian et al., 2023). This is particularly innovative because it tries to fill gaps in marine policy research regarding the relationship between legal frameworks and socioeconomic factors amidst major infrastructural initiatives like CPEC and the BRI. Contributions shall be made towards a deeper understanding of how marine policy can effectively be aligned with sustainable development goals through examining the unique legal challenges. Most existing literature fails to consider the interaction among these factors and land use changes (Khaskheli et al., 2023). Furthermore, the effects of free trade zones on marine ecosystems and the social life of the communities are yet to be explored. The synthesis of international marine law into local regulations has brought new light to marine governance and the need for adaptive legal agendas that can suit rapid changes in economic circumstances; these critical issues, the present research makes valuable contributions to reconciling economic growth with environmental protection, leading to greater sustainability of marine resource management in the region (Johnston et al., 2024).

3.4 Environmental security in an organized format for clarity

A few key data sources for environmental protection research include the World Bank, which has detailed economic and ecological data sets, and the Asian Development Bank, which is well known for publishing on sustainable development in Asia (Buntaine, 2011). The International Maritime Organization also provides marine environmental policy guidelines. Providing additional richness to its corpus, the article Global Environmental Law and Indigenous Participation describes the essential role of Indigenous engagement in environmental governance, emphasizing incorporating a diversity of viewpoints within policy formation (Highlighted in Table 2) (Laskar et al., 2025). Impact of Technologies on Maritime Policies discusses how digital technologies can be harnessed to enable transparency and accountability in environmental governance protection agendas. Environmental security protects natural resources and ecosystems essential to human well-being and global security, stability, and resilience. Transparency and effectiveness demand a top-down

response, beginning with end-to-end risk assessments to graph threats like biodiversity loss, climate change, and pollution. Successful policy instruments, such as international agreements like the Paris Agreement, must be initiated to implement mitigation and adaptation policies (Fekete et al., 2021). Coordination of inter-government, enterprises, and people ensures collective action, while sustainable practices such as using renewable energy, conservation, and circular economies minimize the degradation of the environment. Continuous monitoring by sophisticated technologies enables real-time analysis of information and adaptive management and thus ensures long-term ecological sustainability and socioeconomic security (Sibt-e-Ali et al., 2025).

3.5 Socioeconomic impacts of marine policies

Many socioeconomic situations are influenced by marine regulations, especially in the coastal regions. For instance, research has indicated that tourism and fisheries, through good

TABLE 2 Implementation of the agreement.

Periods	Covenant	Description	Indications
2001	Stockholm Convention on Persistent Organic Pollutants	A global treaty to protect human health and the environment from chemicals that remain intact in the environment for extended periods (POPs).	Stockholm Convention
2002	Johannesburg Declaration on Sustainable Development	Adopted at the World Summit on Sustainable Development, it reaffirmed the global commitment to sustainable development and environmental protection.	UN Johannesburg Summit
2005	Kyoto Protocol (Entered into Force)	An international treaty extending the 1992 UNFCCC, committing industrialized countries to reduce greenhouse gas emissions.	Kyoto Protocol
2010	Nagoya Protocol on Access and Benefit-Sharing	A supplementary agreement to the Convention on Biological Diversity (CBD) focusing on fair and equitable sharing of benefits from genetic resources.	Nagoya Protocol
2015	Paris Agreement	A landmark agreement under the UNFCCC to limit global warming to well below 2°C, aiming for 1.5°C above pre-industrial levels.	Paris Agreement
2017	Minamata Convention on Mercury	A global treaty to protect human health and the environment from anthropogenic emissions and releases of mercury.	Minamata Convention
2018	Regional Agreement on Access to Information, Public Participation, and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement)	The first regional environmental treaty in Latin America and the Caribbean promotes environmental democracy.	Escazú Agreement
2019	UN Climate Action Summit	A global summit was held to accelerate action to implement the Paris Agreement and address climate change.	UN Climate Action Summit
2021	Kunming Declaration	Adopted at the UN Biodiversity Conference (COP15), it sets the stage for a post-2020 global biodiversity framework.	The Kunming Declaration was adopted at COP15. Source: Xinhua
2022	Global Biodiversity Framework (GBF) - Adopted at COP15	A framework to halt and reverse biodiversity loss by 2030, adopted in Montreal, Canada.	GBF COP15
2023	High Seas Treaty (Biodiversity Beyond National Jurisdiction - BBNJ)	A legally binding treaty to protect marine biodiversity in areas beyond national jurisdiction.	BBNJ Treaty

The data from the UN and some countries' official databases have been added to the table of availability.

marine governance, have the potential to improve livelihoods (Bennett, 2019). In China, recent legislation encouraging marine ecological conservation has increased the fish population and improved local incomes, benefiting the regions through reasonable aquaculture. Pakistani and Sri Lankan marine policies benefit most from more sustainable fishing and tourism, although many challenges remain (Khaskheli and Zhao, 2025). The CPEC now allows Pakistani fishermen to build infrastructure that might improve market accessibility and the management of coastal resources (Zheng et al., 2024). Lax enforcement of fishing laws often leads to overfishing, harming the livelihoods of natives. However, Sri Lanka's efforts to incorporate community input into developing marine policies have displayed promise for more active and effective local participation and resource management. However, all three countries can potentially exacerbate inequality through poorly conceived policies that displace local fishermen and damage traditions (Ruano-Chamorro et al., 2023; Palmer, n.d). Such socioeconomic factors must be considered when developing equitable and sustainable marine policies that benefit Communities and environments (Khan et al., 2021).

3.6 Land use transformations and environmental consequences

Land-use changes due to Urbanization, agriculture, and industrialization affect environmental systems more (Smith et al., 2024). For instance, deforestation and wetland conversion to agricultural land encourage forest and wetland habitat loss and

fragmentation. Similarly, runoff and pollution in nearby water bodies are likely to be increased by increased impervious surfaces caused by Urbanization (Shi et al., 2024). Furthermore, deforestation and land degradation are two other ways in which land use changes in the form of increased greenhouse gas emissions enhance climate change (Highlighted in Figure 3). Moreover, BRI may foster green infrastructure development, further ensuring sustainable land use by paying special attention to reforestation efforts and comprehensive land management (Spalevic et al., n.d). Environmental consequences related to land-use change can also be reduced through investments in green technology and renewable resources. In this regard, stringent environmental standards may be required to be implemented as part of such programs to reduce the harmful environmental impact and maintain a balance between economic growth and greenery. The long-term implications of CPEC and BRI on ecological health and future land-use trends have not yet been considered (Karim et al., 2024). To gauge the success of these schemes in providing sustainable land management and affecting the surrounding ecosystems, it is essential to conduct large-scale studies. Furthermore, more research is also needed to determine how the population views land-use changes caused by these schemes and stakeholder involvement in these endeavors (Karim et al., 2024). These gaps must be identified and bridged to attain the maximum potential of BRI and CPEC if optimum land use and environmental gains are to be achieved (Wu and Khaskheli, 2024).

China's economy in the South China Sea, Silk Road development, and Hainan Island constitute the most significant pillars of China's strategic growth, constructing regional wealth and international integration (Zhang et al., 2024). The South China Sea is pivotal in

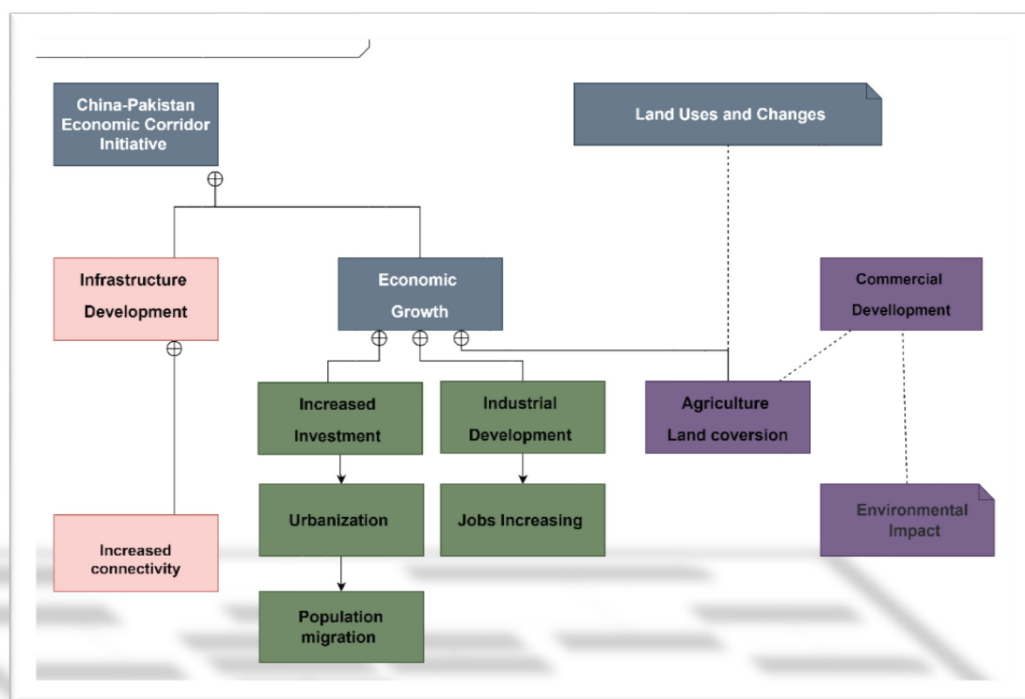


FIGURE 3
Transformations in land use and agricultural development.

China's maritime trade, energy security, and fisheries. Green development projects, like offshore wind farms and solar facilities, promote clean energy shifts because they maintain coastal economies. As China's biggest free trade port, Hainan is an innovation and green energy center. The island is outstanding in photovoltaic (PV) projects, in which solar panels are mounted on buildings, salt pans, and irrigation ditches to generate millions of kilowatt-hours annually. Hainan's tourism and duty-free policies also spur global consumption and exemplify open-market reform (Weng and Li, 2024). The Silk Road Economic Belt boosts world trade and cultural exchange (Ma et al., 2020). Recently opened heritage sites like the Tuyugou Grottoes and Xuanquanzhi Ruins receive visitors worldwide while preserving history. Places like Fuzhou leverage Silk Road connections to advance international trade, receiving billions of investments. These initiatives enhance economic growth, sustainability, and cross-border collaboration, solidifying China's place in global development (Lubchenco et al., 2020).

3.7 The belt and road initiative and marine development

The BRI is highly pertinent to maritime development since it promotes investment in infrastructure and 249, thereby increasing its member states' connectivity through the sea. China's substantial financial resources and experience in large-scale infrastructure projects, which enable trade and economic growth by expanding ports and shipping routes, highlight the country's capacity to carry out the BRI (Hussain et al., 2024). However, now there are also concerns about the sustainability of the ecosystem and the overexploitation of marine resources. One of the critical parts of the BRI is the CPEC, which allows Pakistan to enhance its marine infrastructure (Хакимов, 2024). Still, at the same time, emphasis must be placed on aligning marine legislation with international standards such as UNCLOS (Khan and Xu, 2021). Another important consideration is the CPEC's impact on regional marine ecosystems and how well the existing regulatory frameworks foster sustainability. Other studies that should be undertaken involve stakeholder engagement in marine resource management under the CPEC initiatives. Overall, long-term success with marine projects under the BRI framework depends on balancing economic growth, including environmental conservation and legality. The Belt and Road Initiative and Marine Development are excellent international economic and ocean economy development proposals. They enhance connectivity, sustainable development and economic cooperation, giving rise to a brighter and more prosperous future for the world (Kakar, 2024).

4 Analysis and discussion

4.1 Analysis of results

The examination results evaluate maritime policies' effectiveness and alignment with global legislation, indicate the significance of discussion in monitoring and increasing compliance, and display

trends and challenges in certain areas. The integration of legal frameworks, such as the United Nations Convention on the Law of the Sea (UNCLOS), is required to promote sustainable practice and responsibility for environmental management. This inclusive approach informs subsequent policy enhancements and adjustment measures against global environmental problems (Wood et al., 2024).

4.2 Legislation

The People's Republic of China has issued some legislation and regulations related to marine administration (Wang, 2024), (Highlighted in Tables 3 and 4) show that lately. Most of which are according to UNCLOS. It reflects that these legislative measures intend to claim the territory, protect marine resources, and raise good governance in the marine sector (Lin, 2023; Li, 2024). On the other hand, this is not yet comparable to Pakistan's law, raising concerns about its ability to govern marine resources and borders properly. Such a difference could also challenge Pakistan to engage with regional marine projects, impacting relations with its neighbors (Zhang et al., 2025). It thus strongly underlines the urgent need for legislative action to resolve such problems. Ineffective marine laws in Pakistan would harm its economy by limiting access to vital marine resources, decreasing investment opportunities in the maritime industry, and even creating territorial disputes that could restrain trade and economic growth (Ullah et al., 2017).

4.3 Sustainability practices in marine resource management

Marine resource management must adopt sustainable methods to maintain ocean ecosystems and sustain human livelihoods. Marine

TABLE 3 Laws related to maritime affairs in China.

No	Name Of laws	Legislative time	Revised time
1	Maritime Traffic Safety Law	1983-09-02	2021-04-29
2	Maritime Law	1992.11.07	Not Yet
3	Marine Environmental Protection Law	1982-08-23	2023-10-24
4	Water Pollution Prevention and Control Law	1984-05-11	2017-06-27
5	Port Law	2003-06-28	2018-12-29
6	Waterway Law	2014-12-28	2016-07-02
7	Coast Guard Law	2021-01-22	Not Yet
8	Maritime Procedure Law	1999-12-25	Not Yet
9	Sea Area Use Management Law	2001-10-27	Not Yet
10	Fisheries Law	1986-01-20	2013-12-28
11	Water Law	1988-01-21	2016-07-02

PKULAW Legal and Regulatory Database (PKULAW, n.d).

TABLE 4 Regulations related to maritime affairs in China.

NO	Name of regulations	Legislative	Revised
1	Regulations on the Management of Inland River Traffic Safety	1986-12-16	2019-03-02
2	Regulations on Waterway Management	1987-08-22	2008-12-27
3	Implementation Rules for the Regulations on Waterway Management	1991-08-29	2009-06-23
4	Regulations on the Management of Foreign Nationality Ships	1979-09-18	Not Yet
5	Regulations on Ship Registration	1994-06-02	2014-07-29
6	Measures for the Inspection of International Vessels Calling at or Leaving Ports of the People's Republic of China	1995-03-21	2019-03-02
7	Regulations on International Cruise Ships Docking and Supplying at Ports in the People's Republic of China	2024-04-22	Not Yet
8	Crew Regulations	2007-04-14	2023-07-20
9	Regulations on the Prevention and Control of Marine Environmental Pollution from Ships	2009-09-09	2018-03-19
10	Regulations on Environmental Management for Preventing Ship Dismantling Pollution	1988-05-18	2017-03-01
11	Regulations on the Management of Marine Waste Disposal	1985-03-06	2017-03-01
12	Regulations on the Prevention and Control of Pollution Damage to the Marine Environment by Land-based Pollutants	1990-06-22	Not Yet
13	Regulations on the Management of Marine Environment Damage Caused by Pollution from Coastal Engineering Construction Projects	1990-06-25	2018-03-19
14	Regulations on the Prevention and Control of Pollution Damage to the Marine Environment from Marine Engineering Construction Projects	2006-09-19	2018-03-19
15	Regulations on Investigation and Handling of Maritime Traffic Accidents	1990-03-03	2018-01
16	International Maritime Regulations	2001-12-11	2023-07-20
17	Regulations on Domestic Waterway Transportation Management	2014-01-03	2020-02-24

PKULAW Legal and Regulatory Database (PKULAW, n.d).

protected areas are one of the success stories whereby biodiversity is enhanced, aiding in the recovery of fish populations (Cooke et al., 2023). Local stakeholders have been actively involved in community-based management initiatives that effectively promote sustainable fishing practices and the conservation of marine ecosystems. While CPEC aims to improve the maritime infrastructure in Pakistan, it also needs to strengthen marine laws and bring them in line with the rest of the world (Khan and Chang, 2021). There is a dire shortage of research on how projects under CPEC might be compatible with international law and the sustainable use of the sea. Moreover, there are still more doubts about the effectiveness of the present marine laws in Pakistan and what role local communities play in maintaining sustainability (Bibi et al., 2024; Mohsin et al., 2024). These gaps must be filled to create full agendas that ensure the health of maritime resources and communities for generations to come. It encourages maritime freedoms within the regional areas of Pakistan to successfully establish effective laws and regulations related to the ocean (Review of the state of world marine capture fisheries management, n.d). The interaction between maritime policy and the Belt and Road Initiative greatly influences the legal frameworks, especially the United Nations Convention on the Law of the Sea. We now discuss the complex interplay of discussion and analysis encompassing the legal frameworks. This link is essential in the CPEC. Strategic marine policies are crafted to enable economic development (Mohsin et al., 2025). In China's marine initiatives, resource management and environmental sustainability challenges

present themselves, though they have accessible trade routes and present better economic opportunities, as shown in (Highlighted in Table 5). Therefore, a capable government must manage such challenges so that both countries can capitalize on the marine resources. It is also essential to deter the spiraling conflict and encourage cooperation; this has to be grounded in international law. Hence, these processes demand the critical reassessment of the maximization of socioeconomic benefits to China and Pakistan while strengthening regional peace (Huang and Yan, 2023).

4.4 Marine policy and international law

Marine policy and international law meet in the complex, ever-evolving fields of ocean resource governance, environmental protection, and dispute resolution. Environmental protection has emerged as a fundamental concern of international law, and its principal areas of attention include sustainable development, climate change, biodiversity conservation, and pollution (Khan and Chang, 2018). The United Nations Environment Program (UNEP), the Intergovernmental Panel on Climate Change (IPCC), and other UN agencies are central to developing and advancing global environmental policies. In addition to international treaties like the Paris Agreement and the Minamata Convention, regional treaties like the Escazú Agreement indicate the importance of local action in solving environmental problems. The above table provides a snapshot

TABLE 5 Between 1947 to 2024, Pakistan established the following marine laws and regulations.

Year	Law/Regulation	Purpose	Significance	Orientations
1947	N/A	N/A	N/A	N/A
1976	Territorial Waters and Maritime Zones Act	Defines territorial waters and exclusive economic zone (EEZ)	Establishes jurisdiction over marine resources	Government of Pakistan. (1976). The Territorial Waters and Maritime Zones Act, 1976. (Syed, 1977)
1980	Sindh Fisheries Ordinance	Regulates fisheries in the Sindh province	Promotes sustainable fishing practices in the region	Government of Pakistan. (1983). Pakistan Marine Fisheries Ordinance. (Sayeed, 1984)
1983	Pakistan Marine Fisheries Ordinance	Regulates fishing activities, licensing, and conservation of fish stocks	It aims to prevent overfishing	Khan, M. A. (2010). Marine Resource Management in Pakistan: Challenges and Opportunities. (Khan et al., 2025)
1994	Pakistan Maritime Security Agency Act	Establishes PMSA for maritime law enforcement	Enhances security in maritime zones	Pakistan Maritime Security Agency. (2020). Annual Report on Maritime Security and Fisheries Management. https://dgps.gov.pk/SiteImage/Misc/files/Year%20Book%202020-21.pdf (Saeed et al., 2025)
1997	Pakistan Environmental Protection Act	Provides a framework for environmental protection, including marine ecosystems	Ensures sustainable development and conservation	Government of Pakistan. (1997). Pakistan Environmental Protection Act. (Burki and Naseem, 1997)
2001	Merchant Shipping Ordinance	Regulates shipping, navigation, and maritime safety	Aligns with international maritime conventions	Ali, S. (2015). "The Legal Framework for Marine Fisheries Management in Pakistan." Journal of Marine Policy. https://shippingoffice.gov.pk/pdfs/MSO-2001-UPDATED.pdf (Ahmad et al., 2024)
2012	National Climate Change Policy	Addresses the impacts of climate change on marine and coastal environments	Enhances resilience and adaptive capacity	National Climate Change Policy (October 2021). "Government of Pakistan, Climate Change, Islamabad, Pakistan (Adnan et al., 2024)
2019	Marine Pollution (Prevention and Control) Act	Addresses marine pollution from ships and land-based sources	Implements measures to protect marine ecosystems	World Bank. (2019). "Pakistan: Marine Fisheries and Coastal Management." (Mohsin et al., 2024)
2020-2024	Ongoing developments (e.g., alignment with UNCLOS)	Continuous efforts for sustainable fisheries management and marine biodiversity conservation	Reflects a commitment to international maritime laws	United Nations. (1982). United Nations Convention on the Law of the Sea (UNCLOS). (Rosenne, 1995)

Table of materials collected by the Government of Pakistan, ministries, official UNCLOS documents, and the World Bank.

of some key international legal advancements in ecological law, showing a growing global resolve to save the planet. The individual conventions and agreement sites are worth visiting for additional and more detailed information. This discussion outlines a number of the underpinnings, challenges, and updates on marine policy and international law, focusing on how technology, international collaboration, and a rule of law framework underpin the sustainable governance of the oceans. The United Nations Convention on the Law of the Sea has become a fundamental component in international marine law, providing a robust legal foundation for using and protecting ocean resources (Highlighted in Table 6). As the BRI by China grew in influence, it likewise evolved into a highly robust force in international maritime affairs, having substantial impacts on marine policy while granting significant boosts toward the growth of trade routes and the infrastructural establishment of its naval industry (Shih, 2024). As a flagship enterprise of the BRI, the CPEC increases physical connectivity between China and Pakistan, promoting economic growth on the one hand and raising potential concerns about resource management and environmental sustainability to maintain conformity with international law and meet local socioeconomic demands, ambiguity in the law can create challenging enforcement of

international rules (Ding, 2024; Fidela et al., 2024). Implementation of international obligations requires effective methods of compliance. Marine policy must be compatible with the global Sustainable Development Goals, especially in ensuring that ocean resources are conserved and used sustainably while assuring economic growth and the sustenance of livelihoods. Although international law provides an essential structure for marine policy, concerns about enforcement and integration of technology to create a brighter future for international law and maritime policy, efforts of increased collaboration (Sotskova, 2024).

4.5 Socioeconomic factors in marine policy

Socioeconomic issues, especially in developing countries involved in the BRI, play a vital role in determining marine policy decisions. Most countries, like China and Pakistan, focus on economic growth through tourism, fishing, and infrastructural development, which may lead to increased exploitation of the resources in their maritime jurisdiction (Author et al., 2023). Policy formulation should not forget the livelihoods of coastal people, as many depend on fishing as their primary source of

TABLE 6 The global governance of the United Nations.

Year	Framework/Document	Description	Orientation
2000	Millennium Declaration	Established global commitments to sustainable development.	UN
2002	World Summit on Sustainable Development	This resulted in the Johannesburg Plan of Implementation, which emphasized sustainable development.	UN
2004	UN Convention on Biological Diversity	Focused on the conservation and sustainable use of biological diversity.	CBD
2010	Aichi Biodiversity Targets	Set global biodiversity targets for 2020 to enhance ecosystem protection.	CBD
2015	Paris Agreement	An international treaty to combat climate change and limit global warming to below 2°C.	UNFCCC
2015	2030 Agenda for Sustainable Development	A global framework to end poverty while protecting the planet, including 17 Sustainable Development Goals (SDGs).	UN
2016	United Nations Environment Assembly (UNEA)	Promotes global environmental governance and sustainable development.	UNA
2018	Global Pact for the Environment	It aims to strengthen international environmental law and promote sustainable development.	UN
2021	UN Climate Change Conference (COP26)	Focused on global climate action, reinforcing commitments from the Paris Agreement.	UNFCCC

All datasets by the UN can be accessed through the official link <https://www.un.org/en/observances/biological-diversity-day/convention>.

income. However, it is tough to balance environmental sustainability with economic growth. Marine ecosystems have been experiencing habitat degradation, pollution, and overfishing during rapid growth. Such legislation as the Fisheries Law in China and the Maritime Fisheries Ordinance in Pakistan is thus necessary to regulate resource use and the protection of marine habitats. The policymakers should involve communities at the local level to ensure that the economic benefits do not come at the cost of environmental health. The marine policy can, therefore, incorporate socioeconomic factors and legal compliance to help countries promote practices that ensure economic growth and the protection of ocean resources. This is an approach that can help attain long-term resilience among coastal communities through the attainment of international standards of sustainability (Zafar et al., 2024).

4.6 Sustainability and the belt and road initiative

BRI has to take up sustainability concerns because the monumental infrastructural works involved may adversely impact the environment. While the Belt and Road Initiative is supposed to enhance economic growth and connectivity, it also commonly raises concerns about pollution, habitat destruction, and exploitation of resources (Yasin and Qureshi, 2023). Sustainability must be included at the levels of both design and execution of projects if these challenges are to be overcome. This involves supporting green technology, adhering to environmental laws, and involving local people in decision-making. Regional cooperation would be required to address China and Pakistan's common maritime issues, especially concerning the CPEC. To protect coastal habitats in both countries, Pakistan may benefit from China's experience in enforcing efficient maritime regulations and sustainable practices (Fisheries Act (No. 4 of 1897). | FAOLEX, n.d). In addition to reducing issues related to pollution and overfishing,

cooperative initiatives facilitate the sharing of best practices and technology. Cooperation among participating nations would make sharing resources, technology, and best practices easier, ensuring that projects are socially and environmentally responsible. Moreover, addressing common marine issues is necessary to foster sustainable development in coastal regions. It could decrease adverse impacts on aquatic ecosystems by incorporating sustainability into the marine policy under the BRI. With a focus on sustainability and promoting regional cooperation, the BRI can stimulate economic growth while minimizing ecological degradation (Chen and Madni, 2023).

4.7 The role of China-Pakistan economic corridor in marine policy

CPEC contributes to the shift in regional marine policy by developing maritime infrastructure and connectivity. The development of Gwadar Port under CPEC increases access to international markets through expanding maritime trade channels. Therefore, socioeconomic considerations' strategic importance should be integrated into marine governance, over and above economic benefits. As an example of sustainable marine policy, CPEC is expected to ensure that people benefit from naval activities by implementing procedures that balance environmental care and economic development (Shahzad and Khan, 2024). There might also be some legal barriers to marine activity surrounding the CPEC. International maritime law, such as the United Nations Convention on the Law of the Sea and the Convention on Biological Diversity, is an example of the question of the environment due to pollution and habitat destruction. Strong legislative frameworks are required to solve these issues and guarantee that the maritime policies align with international norms, such as Pakistan's Maritime Fishing Ordinance and the Environmental Protection Act (Sheikh and Hameed, 2024). It envisions the sustainable use of marine resources while ensuring

that economic activities do not harm maritime environments. This is achieved by engaging digital means to monitor and uphold environmental standards. Additionally, it promotes transboundary cooperation to tackle shared environmental challenges. It implements climate resilience strategies to adapt to the impacts of climate change, thus fostering economic and ecological sustainability within the region. CPEC is a vital catalyst for future sea governance, propels sustainable development, and enhances regional stability.

4.8 Economic development through maritime connectivity

The maritime connection significantly supports economic development, especially for countries that have coastlines. Improving port infrastructure and shipping routes can give countries greater market access, reduce transportation costs, and enhance commerce. Marine infrastructure is especially important for the BRI because it connects the participating nations and fosters regional commerce. Better ports and logistics systems attract foreign capital, encouraging local industries' development and opening jobs (Latief et al., 2024). The marine projects within CPEC enhance these advantages, improving connectivity with the Arabian Sea and the international markets. Gwadar Port by CPEC reduces shipment schedules and prices of commodities travelling between China, the Middle East, and beyond, hence setting it up as a prime regional commerce hub. This can change the business face, promote exports, and strengthen the Pakistani economy globally. In this regard, there is a requirement to reassess the role of maritime policy in ensuring economic stability and vulnerability (Baafi, 2024). A good naval policy would meet the coastal society requirements, marine environments, and resource use sustainability. Integrating economic goals into environmental management practices allows countries to increase their resiliency to economic shocks and achieve long-term stability. Invest in oceanic linkages and inclusive oceanic policy to help achieve sustained growth and prosperity (Wuwung et al., 2024).

5 Conclusions

Environmental Protection and marine policy highlight the fundamental challenges of balancing legal frameworks and socio-economic factors, such as stakeholder conflicts and resource dependency. The research highlights reconciling the latter to achieve sustainable environmental outcomes. The main challenges are gaps in legal enforcement, transboundary issues, and socio-economic forces such as resource dependency eroding effective governance. The recommendations emphasize the requirement of well-balanced actions to meet legal, socioeconomic, and environmental goals. All these related issues must be addressed to form equitable and effective marine conservation plans, inclusive legal approaches, and improved stakeholder engagement mechanisms to enable sustainable marine policy-making plans. The complex challenges to effective marine

conservation, with emphasis on the need for balanced governance. The authors' innovative research developed the proposed model, bridging crucial gaps in marine policy by integrating legal systems with socioeconomic circumstances. The research design analyses marine policy and global cooperation on four principal dimensions: international agreements, UNCLOS, economic growth pressures, legal regulatory systems, and environmental sustainability. Evidence indicates that irregular enforcement, competing maritime claims, and industrial exploitation undermine conservation, and coastal people's livelihoods make policy implementation even more challenging. These steps would prove critical in creating long-term ecological and socio-economic achievement. The research accentuates the need to resolve legal and socioeconomic problems so that marine policies can effectively protect environmental assets in terms of broader socio-economic interests. An integrated approach is necessary for long-term marine protection and regional development. As such, China's success at marine ecological preservation and sustainable harvesting of fisheries through UNCLOS precepts holds lessons in institution-building and the exchange of information for establishing strong legal systems. The provisions of UNCLOS have enabled China to make significant progress in the sustainable management of fisheries and the conservation of marine resources. The study suggests increased multilateral cooperation, adaptive legal structures, and sustainable economic choices. In the event of no immediate changes, marine degradation would be accelerated, posing a risk to ecosystems and human welfare. An integrated, interdisciplinary approach is needed for future marine management.

5.1 Limitations and future research directions

Although this study comprehensively addresses legal and socioeconomic barriers to effective marine environmental conservation, some limitations must be identified. First, this study is founded on theory, with the research being constructed based on existing legal instruments and policy documents rather than empirical field evidence. Such analysis may fail to capture local performers' implementation barriers. Second, the ever-evolving dynamics of sea environments and evolving environmental law require some of these findings to be updated occasionally. Third, the research addresses generic marine policy matters and lacks region-specific case studies, thus possibly limiting its applicability to individual jurisdictional settings. Research also does not provide measurable estimates of economic impacts on coastal businesses mandated by environmental protection policies, a strategic benefit it would have conferred to policymakers.

In contrast, research estimates socioeconomic factors, but it is not comprehensive when examining cultural drivers most likely to cause communities to adopt marine conservation policies. Future studies must focus on several areas to improve our knowledge of how legal systems interact with socioeconomic environments in marine policy. It is essential to examine the long-term effects of BRI projects on the marine ecosystem at the local level and assess how

digital technologies fare in monitoring compliance with environmental legislation. Research should also explore stakeholder engagement strategies to promote cooperation among governments, the local community, and private interests. Through gap-filling, future research will contribute to developing more robust and sustained marine policies that more effectively balance economic development and sustainability, making marine ecosystems strong enough to absorb the tremendous global pressures in the future.

5.2 Recommendation letters

- Fortifying alliances with nearby nations and international organizations can improve knowledge transfer and capacity building. Cooperative efforts in maritime governance will result in improved ecological results and shared benefits.
- Pakistan can pick up ideas on China's practice of maritime regulation, such as the recent enactments for controlling sustainable fisheries and marine ecological preservation. By reviewing such models, Pakistan can use relevant strategies to promote economic development and sustainability.
- Consultation with other BRI countries would provide valuable input on best practices in sustainable operations and good maritime policy. It would also enhance Pakistan's maritime management so that schemes for development are harmonized with environmental protection through best practices and experience sharing.
- Enhance the legislation for Pakistan's coastal and marine resources. This entails enacting comprehensive legislation encompassing sustainable aspects and handling land-use transitions effectively, taking lessons from successful examples like China's recent legislative action.
- Adaptive management practices must be implemented so that the policy can be responsive and adapt to constantly changing social and economic needs and environmental realities. This approach will decrease the risks of changes in land use that result in deteriorating environments.
- Pakistan should invest heavily in comprehensive research and data collection studies to address the shortcomings identified in this study, which will help make informed decisions and analyze the long-term implications of maritime policy within the framework of CPEC.
- It is essential to involve the stakeholders, local communities, and relevant industries in policy-making. Including these groups will ensure a variety of perspectives that lead to broader acceptance and, hence, the success of marine policy.
- Given the advantage that goes to UNCLOS, it is high time Pakistan brings its maritime regulatory system to globally accepted standards. This would transform regional security, including cooperation between countries and access to efficiently handled regional resources.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding authors.

Author contributions

MB: Resources, Conceptualization, Writing – original draft, Formal analysis, Methodology, Data curation. YL: Conceptualization, Visualization, Formal analysis, Writing – original draft, Software, Data curation. YZ: Writing – review & editing, Investigation, Funding acquisition, Supervision, Formal analysis, Project administration. WS: Project administration, Supervision, Investigation, Funding acquisition, Formal analysis, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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The author(s) declare that no Generative AI was used in the creation of this manuscript.

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