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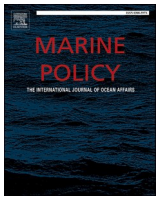

Charting sustainable waters: Governance challenges and opportunities for fisheries and coastal beach resources in a West African country

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ABSTRACT

Marine fisheries and beaches (i.e., backshore, foreshore and shoreface) are essential for providing ecosystem services globally, with coastal states being at the forefront of this benefit. Consequently, several policies, legislations, and governance processes must be formulated to ensure their sustainable use due to the impact of anthropogenic and natural pressures. This study aims to analyse the legal and institutional frameworks for the management of marine fisheries and beach resources (such as flora (coconut), fauna (ghost crabs), dunes, and rocky components) under key international laws and conventions, using Ghana as a case study. The study identifies the strengths, weaknesses, opportunities, and threats (SWOT) within resource management, as well as their impact on the country's progress in the attainment of the Sustainable Development Goals (SDGs) and Africa Union Agenda 2063. Data was collected through interviews with fishers, coastal residents, and other relevant stakeholders, as well as a review of secondary data. The results unveil a distinctive contrast in the regulatory landscape between fisheries and beach resources. While numerous policies have been formulated to ensure the sustainable management of fisheries, the same level of attention and commitment has not been extended to beach resources. The SWOT analysis revealed that some of the strengths in the governance of marine fisheries and beach resources rest on the availability of institutions and laws. The weakness lies in inadequate enforcement and data gathering and analyses to inform decision making. This study provides as an illuminating exploration into the legal and institutional underpinnings of marine fisheries and beach resource management in Ghana, shedding light on the critical junctures where improvements are needed.

1. Introduction

Globally, marine and coastal environmental governance has become essential due to the growing crisis in their ecology brought about by multiple competing economic and social sectors [15,44,107]. These sectors contribute food (i.e., over 78 million tonnes of fish in 2020), revenue (e.g., over US$ 4 trillion in marine tourism), create livelihood (over 200 million in marine fisheries) and habitation (about 40 % of the world's population) for millions of people worldwide [36,79,102,110]. For instance, in Ghana, the marine fisheries sector generates over US$ 1 billion per annum and support essential livelihood of fishers and traders [39,80]. Beaches (i.e., backshore, foreshore and shoreface) serve as recreational, tourism and developmental sites for housing and other infrastructure [84,93]. Human activities associated with these sectors whether *in situ* of coastal zones, marine or from terrestrial sources, exert pressure on coastal and marine resources at unsustainable levels [24,56]. These activities have and continue to contribute to ecological changes in the status (i.e., from abundance to vulnerable, threatened or

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endangered) of some species and habitats, as well as accelerating the pressure from climate change [24,94,108]. For instance, poor water quality, including increased sea fishing pressure, and other pressures from the human activities have contributed to the bleaching of coral reefs, decline of *Sardinella spp*., the loss of nursery sites for sea turtle species (e.g., *Lepidochelys olivacea* and *Dermochelys coriacea*), and exacerbate geo-environmental hazards (e.g., coastal erosion), globally and in Ghana [43,50,100].

Given the uniqueness of coastal and marine environments in terms of their characteristics, resources, the competing sectors and their contribution to the global socio-economy (including Ghana), they require appropriate governance through relevant legislative and institutional frameworks [34,65]. In the absence of appropriate governance, i.e., established rules and laydown processes for the exploitation of common resources, usage becomes subject to individual discretion, increasing the vulnerability of these resources to unsustainable levels [14,90]. Although the specific forms of governance may vary across countries depending on the political, fiscal, socioeconomic, and cultural context, the governance must emphasise the three key components, i.e., laws, institutional frameworks and the mechanism of implementation, coupled with fairness, rules, accountability, stakeholder participation, and transparency at all levels [88,91,104,109,111,113]. Adequate and appropriate governance can be the rallying point for decision-makers, globally and in Ghana, to organise society and the citizenry to protect the coastal and marine resources, meeting the relevant Sustainable Development Goals (SDGs) (1, 2, 8, 12, and 14), the objectives outlined in the Convention on Biological Diversity (post-2020 Global Biodiversity Framework targets) and African Union (AU) Agenda 2063 [6,61,63,65, 91,99,114,122].

Although international and regional laws and conventions (e.g., United Nations Convention on the Law of the Sea (UNCLOS)) are critical in the governance of coastal and marine resources, including fisheries and beaches, national commitment is the sole preserve of the countries involved [101]. Globally, central governments (top-down) are the primary driver, complemented by formal structures and some co-management systems led by communities and users [38,73,106]. However, these formal structures often have deficiencies due to differences in objectives and values, especially under cross-sectorial

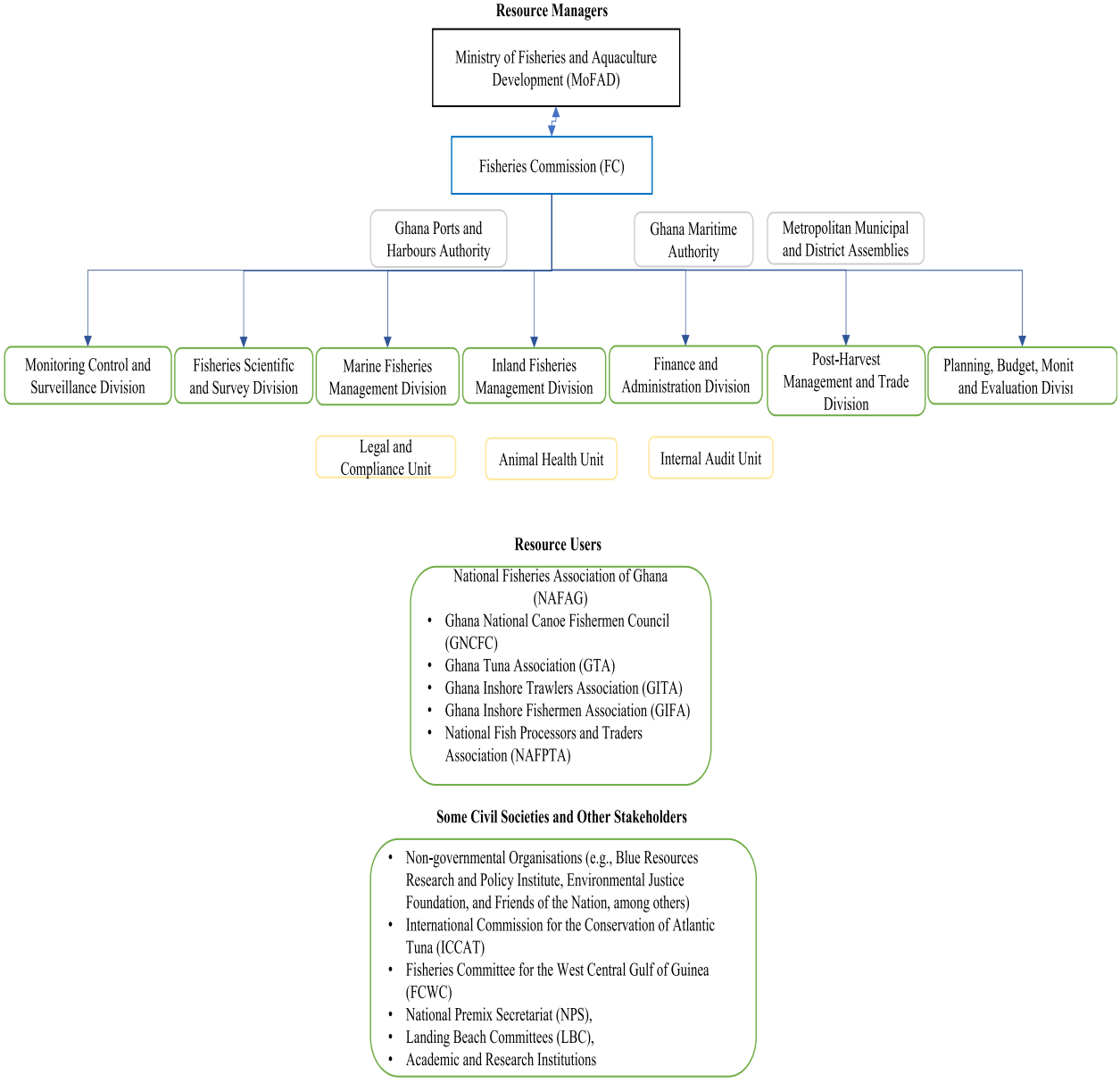

Fig. 1. The stakeholders in the fisheries sector of Ghana, including managers, resource users, civil societies, and academic and research institutions.

jurisdictions, leading to the marginalisation of some resources [15]. For instance, in Ghana, government ministries (e.g., the Ministry of Fisheries and Aquaculture Development and the Ministry of Environment, Science, Technology, and Innovations) and agencies (e.g., Fisheries Commission, Land Use and Spatial Planning Authority and Ghana Maritime Authority) (as illustrated in Figs. 1 and 2) manage these resources [70,71,73]. Due to inadequate synergies between these organisations (i.e., in beach management), prioritisation of one resource (i.e., fisheries with scientific staff under the Fisheries Commission of Ghana) over the other (beaches) or marginalisation (i.e., due to scale and remoteness) by decision-makers, overlapping responsibilities, and gaps in the legislative framework, the sustainable conservation of these resources is threatened. In an era of a complex global wicked problem such as climate change and the need for shared management responsibility, it is essential for decision-makers in coastal countries (i.e., including Ghana) that have ratified international guidelines and conventions to have the right tools and information to ensure the adequacy of management and governance regimes for the sustainability of resources [76,85].

The objectives of this manuscript are to examine the institutional and legal framework governing fisheries and beach resources in Ghana using key international guidelines and conventions such as the United Nations Convention on the Law of the Sea (UNCLOS), the Food and Agriculture Organisation's Code of Conduct for Responsible Fisheries, the African Union (AU) Agenda 2063 and the Convention on Biological Diversity. The study also employs both secondary data analysis and stakeholder questionnaires to evaluate the governance of marine fisheries and beach resources, specifically the backshore, foreshore and shoreface. Furthermore, the research aims to identify and assess the strengths, weaknesses, opportunities, and threats within resource governance, as well as the sources of gaps and biases in current legislation and management practices to provide guidance for decision-makers.

2. Theoretical background

Good governance is critical in determining marine and coastal resource use, sustainability, and conservation effectiveness [96]. International guidelines and conventions, including the UNCLOS, SDGs, and Food and Agriculture Organisation's Code of Conduct for Responsible Fisheries, have integrated good governance for marine and coastal resources [7,96]. They have implications for fisheries and beach resources at the domestic level and may contribute to establishing institutional and legal frameworks by providing the mechanisms and procedures for implementation and compliance [58]. However, without implementing and enforcing rules and norms at the domestic level, the effectiveness of harmonising with international guidelines and conventions in achieving the goals will not materialise [89].

Institutional and legal frameworks in fisheries and beach governance are essential in decision-making due to the challenges with sustainability in a changing climate [19]. Thus, throughout human history, the institutional and legal frameworks have evolved from managing and controlling the behaviour of humans to ways fisheries and beaches are protected [68]. The institution and legal frameworks refer to the structure of government and its agencies, civil societies and other stakeholders, as well as the laws and regulations (with amendments), ordinances, and enforcement mechanisms [52]. They define the course of action that influences the enhancement of fisheries and beach

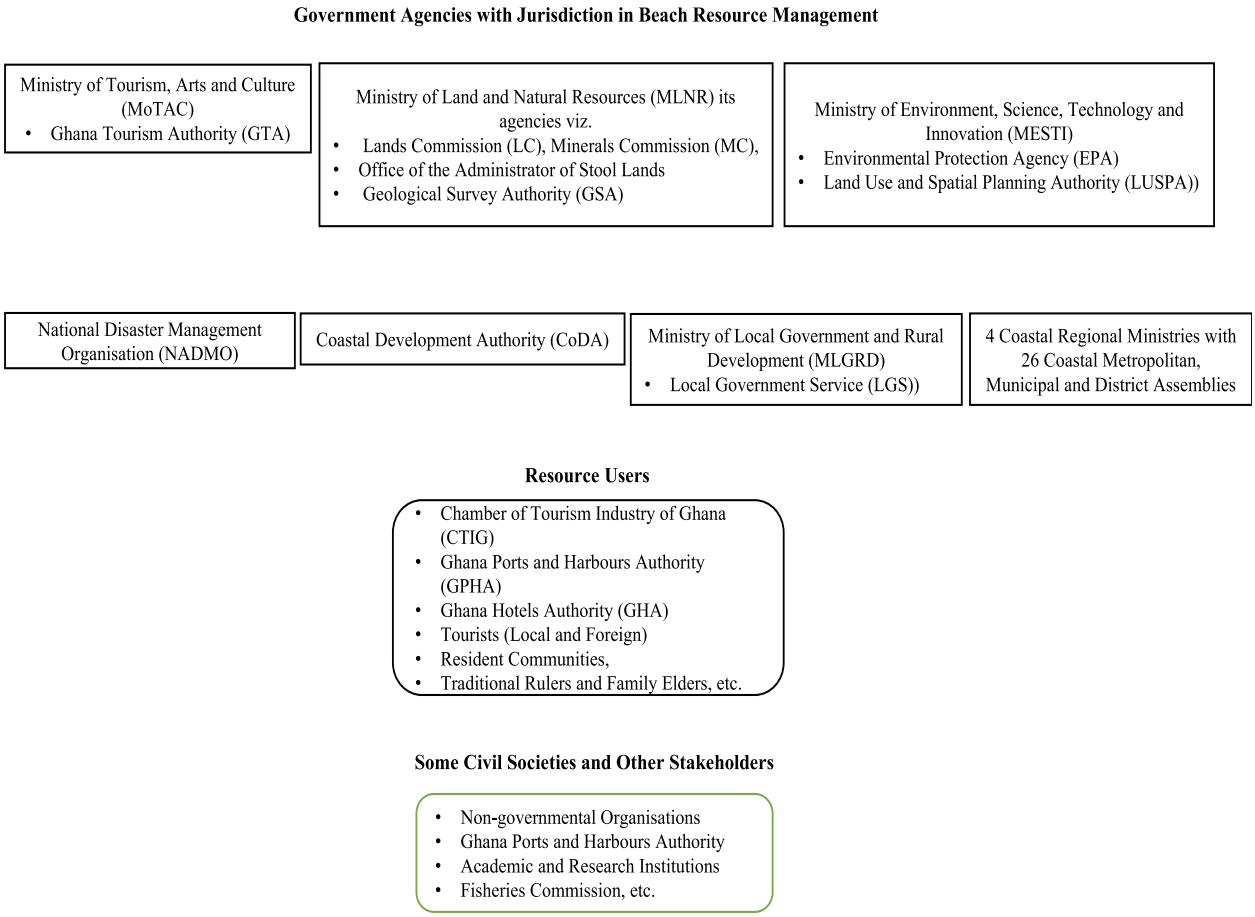

Fig. 2. Stakeholders in the management and utilisation of beaches in Ghana.

resource stewardship [1]. It is worth noting that inadequate institutional and legal framework breeds opaqueness and uncertainty, and challenges the course and consistency of delivery of intended objectives [51]. Although, there are different levels of governance capacity and resources that are devoted to the sectors, adequacy of legal and institutional framework, and processes contribute to the realisation of effective management [68,71].

Formal governance codification of policy, rules and accompanying institutions that govern access, exclusion, planning and engagement over fisheries and beach resources into constitutions, laws, regulations and management plans is fundamental to the institutional and legal frameworks [35]. Additionally, stakeholders' perception of institutional and legal framework is essential due to the reliance on the success of governance on how they endorse, accept, or reject the frameworks that help diagnose strengths, weaknesses and opportunities, as well as understand the relationship between the governed and the governing system [7].

3. Materials and methods

3.1. Study area

Ghana (see Fig. 3), a sub-Saharan West African coastal country bordered on the north by Burkina Faso, to the south by the Gulf of Guinea (Atlantic Ocean), to the east by Togo, and on the west by Cote d'Ivoire, was selected for the study due to its ratification of the several conventions for the management of coastal and marine resources (i.e., fisheries, beachfront, dunes, rocky beaches, and biodiversity) [29,103,121]. Additionally, marine fishing and activities around beaches (e.g., tourism, and sand and stone mining) are essential economic ventures in Ghana [66,118]. The country has a coastline of 550 km (i.e., with over 70 % being sandy), a lower middle-income status, practices presidential democracy with strong institutions (i.e., the Parliament of Ghana, judiciary and civil societies) and ranked tops in several governance surveys across Africa [3,5,112,118]. Tema (i.e., in Greater Accra) and Cape Coast (i.e., Central) are essential coastal fishing communities, with

Fig. 3. The coastal and marine zone of Ghana, including the two sites (i.e., Cape Coast and Tema), where questionnaires were administered to fisheries managers, fishers, residents, and non-residents.

beachfront that serves as leisure centres for both domestic and international tourist in Ghana.

3.2. Method

The research methodology for this study is a multi-approach that aims to obtain a comprehensive understanding of fisheries and beach resource governance in Ghana. Large data collection and thorough analysis were conducted to ensure a comprehensive assessment.

3.2.1. Data collection

Predefined keywords and search phrases, such as '*UNCLOS*', '*FAO's code of conduct for responsible fisheries*', '*coastal and marine governance*', '*human activities in coastal and marine environment globally*', '*coastal and marine resources policy of Ghana*' '*fisheries management in Ghana*', and '*beach management in Ghana*', among others were developed [48,100]. These were used to systematically search the Web of Knowledge (ISI Web of Science), Science Direct (Scopus), Google Scholar, official web portals of relevant government institutions (e.g., Parliament of Ghana, National Development Planning Commission), and Google [31]. The searches identified 68 relevant documents, including 24 peer-reviewed articles in ISI journals, 14 official government documents, 4 international conventions, 1 book, 10 reports, 2 theses, and 13 other relevant literature through title, abstract, conclusions, and full-text readings. A systematic review of relevant documents formed the foundation of the data collection process. This includes a comprehensive assessment of the United Nations Convention on the Law of the Sea, FAO's Code of Conduct for Responsible Fisheries, Ghana's legal framework, encompassing the Constitution and key laws like the Fisheries Act 625 of 2002, Coastal Development Authority Act 961 of 2017, Environmental Protection Act 490 of 1994, and Fisheries Regulations L.I. 1968 of 2010. Additionally, policy documents and management plans were also assessed, including the Fisheries Management Plan of Ghana-A National Policy for the Management of Fisheries Sector 2015–2019 and 2022–2026, among others through full-text reading.

To obtain valuable insights from key stakeholders involved in the management and utilisation of fisheries and beach resources in Ghana, structured interviews were conducted with questionnaires to explore the views of respondents. A total of 69 participants were interviewed (between January and February 2020), including 9 fisheries managers, 46 fishers representing small-scale, semi-industrial, and industrial sectors, and 14 coastal and non-coastal residents. A self-administered questionnaire was used for fisheries managers who were purposefully sampled [92,120]. Face-to-face administration of questionnaires was used after randomly selecting fishers and coastal resident respondents in Cape Coast and Tema, with the help of research assistants [86,87,92]. Non-coastal residents' respondents were purposively sampled in these locations for divergent perspectives [21]. The questionnaires that were administered for an in-depth data gathering on awareness of management laws on fisheries and beach resources, enforcement and sensitisation activities, and status of governance structure, among others. Each group of respondents was administered a separated set of questionnaires.

3.2.2. Data analysis

The information gathered through document review and interviews were processed for data analysis. This involved:

An assessment of the collected data to identify key trends, regulatory gaps, and areas of convergence or divergence within the context of marine fisheries and beach resource governance landscape of Ghana, UNCLOS, FAO's Code of Conduct for Responsible Fisheries, the sustainable development goals (SDGs), the African Union (AU) Agenda 2063 and Convention on Biological Diversity. An in-depth analysis was conducted to interpret the significance of the identified information such as planning and access management, providing insights into the implications for the management of marine fisheries and beach resources in Ghana. Data from the questionnaires administered were analysed with the IBM SPSS Statistics by coding the responses of respondents [22]. Relevant data points and findings were systematically tabulated to facilitate organisation and comparison (See below – Results section) to identify the general patterns and disparities.

3.2.3. SWOT analysis

Strength, Weakness, Opportunity, and Threats (SWOT) analysis of the sector management was also conducted. SWOT is a strategic and an effective situational analysis tool used to measure an organisation or individual or sector's capabilities and deficiencies that help managers to understand the organisational and environmental factors [17,46]. SWOT provides the opportunity to focus on all aspects of the internal and external environment of the organisation or resources. It is a road map that guides one from the general to the specific, is easy to communicate, and helps to identify future opportunities [17,46].

In this study, SWOT analysis was used as a strategic tool to appraise the performance of the governance framework of fisheries and beach resources in Ghana [67,98]. To ensure rigorous and comprehensive analysis we utilised a combination of expert opinion, secondary data sources and questionnaires administered to fisheries managers, fishers, coastal and non-coastal respondents [67,98]. The data were systematically tabulated, providing a clear and structured overview of the SWOT analysis outcomes. The research approach ensured a thorough examination of Ghana's marine fisheries and beach resource governance, enabling us to draw informed conclusions, perspectives, and recommendations.

4. Results

4.1. Fisheries and beach management measures

Article 55 of the United Nations Convention on the Law of the Sea (UNCLOS) stipulates that countries possess sovereign rights to explore and exploit as well as conserve and manage living and non-living resources within their exclusive economic zones. The right to conserve and utilise living marine resources has further impetuous under *Articles 61* and *62* of the UNCLOS, with *Article 73* outlining the necessity of compliance in these activities.

Ghana's policies for the fisheries sector include the

> *"Safeguarding, conservation, and sustainable management of the resources, developing capture fisheries production as well as promote aquaculture development"* [74].

While that for the management of beach resources include

> *"Increasing investment in control-structures (gabions and boulder revetments to arrest erosion), promotion of afforestation to prevent erosion, reduction in pollution and poor sanitation and ensuring proper siting of industries (adopted from coastal policy of Ghana)"* [77].

The current legal (i.e., Fisheries Act 625 of 2002, Fisheries Regulations L.I. 1968 of 2010 (Fisheries (Amendment) Regulations L.I. 2217 of 2015) regime for fisheries in Ghana includes planning the fisheries (as illustrated in Table 1) industry through research (i.e., in compliance with *Article 61(2)* of UNCLOS) and cooperation with all stakeholders, whether at the local, sub-regional, or international level. There are access management measures through licensing and permit regimes for all fleets and types of fishing, seasonal closures (i.e., July to August annually), declaration of protected areas, gear prescriptions (i.e., in compliance with *Article 8, Section (Sec.) 8.5* of FAO Code of Conduct for Responsible Fishing (CoCRF) and *Article 62 (a)* of UNCLOS), where they can be used and the monitoring of fishing activities. Concerning access management, when some fishers were asked, "*What type of license do you personally hold apart from that of the fishing vessel?"* their response was, "*Bosun license*." Some artisanal fishers responded, "*Yes, canoe numbering*" when asked "*Do you have a license for your fishing craft*?"

Table 1
Marine fisheries and beach resource governance in the coastal and marine areas of Ghana.

Governance	Area of regulation	International conventions	National law	Ghana's relevant institution	Gaps in the national governance
Marine fisheries management measures	Fisheries planning (with scientific data, stakeholder collaboration), management of access (including license, quota, monitoring, and control), catch (prohibition of gravid, juvenile, mammal landings), conflicts resolution and pollution	Articles 55, 61, 62 and 73 of the United Nations Convention on the Law of the Sea (UNCLOS), Article 8, Sections. 8.4. and 8.5 of FAO Code of Conduct for Responsible Fisheries (CoCRF) Sustainable Development Goals (12 and 14), Goal 6 of African Union Agenda 2063	Article 87(c) and 269(1) of Ghana's 1992 constitution; Fisheries Act, 625 of 2002 and Fisheries Regulations L.I. 1968 of 2010 (Fisheries (Amendment) Regulations L.I. 2217 of 2015); Ghana Maritime Authority Act 630 of 2002	Ministry of Fisheries and Aquaculture Development and Fisheries Commission (i.e., Marine Fisheries Research Division, Fisheries Scientific Survey Division, Monitoring Control and Surveillance Division, Fisheries Enforcement Unit and Fisheries Settlement Committee) with support from Ministry of Transport (i.e., Ghana Ports and Harbours Authority and Ghana Maritime Authority).	Monitoring is mainly in the industrial fishery sector and sometimes in semi-industrial. Small-scale crafts do not have the required equipment hence monitoring is inefficient. Although fishermen are not supposed to land gravid fishes, they cannot also dump fish caught into the aquatic environment. Community-Based Fisheries Committees are not mentioned in the resolution of conflicts of the Fisheries Act 625 of 2002.
Beach management measures	Beach planning, management of access (e.g., authorisation and permit regime for structures, entertainment, excavation, and sand mining), and pollution	Articles 55, 61, 62 and 73 of the United Nations Convention on the Law of the Sea (UNCLOS), Sustainable Development Goals (12), Goal 6 of African Union Agenda 2063	Article 87(c) and 269(1) of Ghana's 1992 constitution; Beaches Obstructions Ordinance (CAP 240), Coastal Development Authority Act 961 of 2017, Land Use and Spatial Planning Act 925 of 2016, Land Commission Act 767 of 2008, Minerals Commission Act 703 of 2006, Environment Protection Agency Act 490 of 1994, Environmental Assessment Regulations L.I. 1652 of 1999, Ghana Maritime Authority Act 630 of 2002	Coastal Development Authority (CoDA), Land Use and Spatial Planning Authority, Ghana Maritime Authority, Lands Commission, Coastal Metropolitan Municipal and District Assemblies, and Environmental Protection Agency of Ghana all have some institutional oversight.	Beach resources are not singled-out for planning. Tenet of co-management is non-existent, and law for the management beaches is inadequate and obsolete with last amendment being in the 1950s. Public hearings are only organised when there is a public outcry about a particular project. Only sand and not coastal flora and fauna along the beaches are mentioned for protection from removal in the Beaches Obstructions Ordinance (CAP 240). Lack of long-term master plan, dedicated scientific staff and beach categorisation.

Table 2
Strengths, weaknesses, opportunities, and threats (SWOT) in fisheries and beach resource governance in Ghana.

SWOT analysis	Fisheries	Beach	Source
Strengths	Availability of Fisheries policies, Fisheries Act 625 and Regulations LI 1968 with amendments. Translation of Fisheries Regulations, 2010 (L.I. 1968) into 3 Ghanaian languages. Ministry of Fisheries and Aquaculture Development and Fisheries Commission (Divisions and Units). Fisheries academic and research institution Donor agencies, regional and international organisations, and NGOs.	Beaches Obstruction Ordinance (CAP 240) Environmental, land and natural resource policies. Land use and spatial planning law, land commission law, coastal bylaws, EPA laws and regulations. Academic and research institutions. Government agencies with responsibility towards coastal management and non-governmental organisations.	Fisheries managers, Eshun et al. [32]; Resident and non-resident respondents; National Development Planning Commission [77]
Weakness	Corruption, poor remuneration of fisheries officers, inadequate enforcement of laws and regulations, disregard for customary laws Inadequate staff, perennial technical and financial logistics constraint Lack of research vessels and inadequate data record, reporting, and monitoring of small-scale fishery	Too many state agencies with oversight leading to no management. Inadequate direct regulation and a master plan. inadequate data on the several people using the resource per annum.	Fisheries managers, Eshun et al. [32] Jonah [54]
Opportunities	Amendment of existing laws and improve planning. Co-management with legal backing and logistics for Community-Based Fisheries Management Committees (CBFMCs). Collaboration with local, sub-regional, regional, and international organisations. Reduce overcapacity in fleet number (small-scale sector) and fleet capacity (semi-industrial and industrial) and increasing license renewal fees. Demarcation of protected areas and extension of closed fishing season. Reduce discards and allocation of quota to small-scale fishery. Provision of supplementary livelihood and removal of fuel subsidies.	Strengthen or promulgate adequate policies, regulations, and institutions for the management of beaches. Co-management and awareness creation. Zoning and creation of buffer zones. Planning for hazard response. Increase sustainable use for jobs and revenue creation. Achieve blue flag status.	Fisheries managers, MoFAD [72]; UNEP [114]
Threats	Subsidies (i.e., on outboard motors, and premixed fuel) and conflicts. Continuous politicisation of fisheries resources. Destructive methods of fishing, and landing of juvenile and gravid fishes. Pollution and deforestation of coastal wetlands and lagoons. Climate change, sea level rise and coastal erosion. Fishing within the 30 m depth contour by industrial vessels. Corruption and poor remuneration of fisheries officers	Land tenure system and urbanisation. Pollution, sanitation (open defecation, plastic, and domestic waste), sand and stone mining, and deforestation. Climate changes, sea level rise, coastal erosion, and tidal floods. Disregard and relegation of customary laws. Conflict between public and private use, disregard for customary beliefs.	Fisheries managers, Ameyaw [9]; Appeaning-Addo [11]; Appeaning-Addo and Adeyemi [12] ; Bokpe [20]; Glover [42]; Jonah et al. [55] [55]; Takyi et al. [99]; Wallner-Hahn et al. [119]; Adu-Boahen and Dadson [4]; Dosu [28]; Resident and non-resident respondents

The legislation controls catch through quota allocation (i.e., for trawl and tuna vessels), requires catch recordings, minimum mesh size and fish size, prohibits the catch and landing of gravid finfish, shellfish, and mammals and prohibits illegal, unreported, and unregulated fishing and destructive methods (i.e., in compliance with *Article 8, Sec. 8.4* of FAO CoCRF, and Articles 61, 63 and 65 of UNCLOS). Regarding the recording of catch, respondents in the industrial and semi-industrial fisheries answered "*Yes, in manual logbook*", when asked, "*Do you formally report the catch for each trip?*", with artisanal fishers responding "*No*." Additionally, when fishers were asked a question on destructive fishing, the response was "*No use of explosives.*"

The legal framework also includes provisions for conflict management through the dispute settlement committee, *Part 1 Sec. 10* of Fisheries Act 625 of 2002 (confers on the Fisheries Commission (FC) with the sole power to appoint members and other stakeholders to settle disputes), which has the power to hear complaints and adjudicate on them.

To ensure effective management, Ministry of Fisheries and Aquaculture Development (MoFAD) and FC are the mandated institutions with oversight responsibility for the implementation of laws and regulations. Additionally, the Fisheries Act 625 of 2002 which establishes the FC, provides for the creation of a Monitoring, Control and Surveillance Division and the Fisheries Enforcement Unit (FEU) (a multi taskforce) responsible for ensuring the compliance of fisheries laws and regulations by fishers. The law also makes provision for the creation of Fisheries Scientific Survey Division, which is to undertake periodic scientific fisheries data collection (e.g., port sampling of catch) and receive catch data for analysis from fishers and observers. MoFAD and FC also collaborate with other governmental agencies (Ghana Maritime Authority and Ghana Ports and Harbours Authority) under the Ministry of Transport, for the licensing of vessels and fishers (e.g., captains).

The available legal frameworks under which beach resource management, planning, access, and pollution control fall under (see Table 1) includes the Beach Obstruction Ordinance (CAP 240), Coastal Development Authority Act 961 of 2017, Land Use and Spatial Planning Act 925 of 2016, Land Commission Act 767 of 2008, and the Local Government Act 936 of 2016. Others include the Ghana Maritime Authority Act 630 of 2002, Environmental Protection Act 490 of 1994, Minerals Commission Act 703 of 2006, Environmental Assessment Regulation L.I. 1652 of 1999, and Coastal Metropolitan, Municipal, and District Assemblies (MMDAs) by-laws. This follows *Articles 55, 61, 62* and *73* of the United Nations Convention on the Law of the Sea (UNCLOS), and Sustainable Development Goals (12). *Sections 2 and 3* of the Beaches Obstructions Ordinance (CAP 240) make provision for the reservation of portions of the beaches for any purpose (by the President), have access

Table 3
Fisheries manager's response, including their level of knowledge of fisheries policy and laws, rating of the awareness of fishers concerning Ghana's fisheries regulations, the level of stakeholder engagement before management plans, frequency of stakeholder sensitisation, and impact of sensitisation on attitudinal change of fishers.

Question	Response	Percentage of response (n = 9)
Level of knowledge of fisheries policy, and laws	Good	33.3
	Very good	66.7
Awareness of fishers concerning fisheries regulation	Good	77.8
	Excellent	22.2
level of stakeholder engagement before management plan	Good	22.2
	Very good	77.8
Impact of sensitisation on attitudinal change of fishers	Good	33.3
	Very good	66.7
Frequency of fishers' engagement	Monthly	33.3
	Occasionally	66.7
Level of fishers' participation of engagement	Good	33.3
	Very good	66.7
Major weakness of fisheries governance	Enforcement	100
	Compliance of fishers	
	Inadequate staff and logistics	
	Lack of research vessel	
Activities that persist	Illegal unreported and regulated fishing	100
	Unprescribed nets	66.7
	Light fishing	100
	Landing of Juvenile	100

restrictions through licensing (e.g., landing vessels, animals, and articles), and the prohibition (with penalty) of the removal of sand, stones, and artificial protection without prior approval from the District Chief Executive.

When some coastal and non-coastal residents were asked, "*Do you know any laws that helps in the management of beaches and its resources?*", their response were "*Yes, do not poach turtle*" and "*Turtles are not allowed to be captured by fishermen, (and) must be sent back (released) to the water.*"

The gaps identified in the Beaches Obstructions Ordinance (CAP 240) is its obsolete and inadequate (i.e., lacking planning framework, extensive access, and pollution management) state contributing to its inability to address current challenges facing the use of beaches in Ghana. Beach use planning is part of the general coastal and land use without special consideration, like fisheries. The jurisdictional mandates include issuing permits for construction, excavation, mining of sand and rocks, pollution prevention and an Environmental Impact Assessment (EIA) approved by the Environmental Protection Agency of Ghana before implementing projects. The tenets of co-management with

Table 4
The responses of the fishers interviewed concerning their awareness of the fisheries policy and laws of Ghana, their response concerning sensitisation by the fisheries managers, participation in workshops, and their perception on the level of enforcement carried out by the fisheries managers.

Question	Response	Percentage of response (n = 46)
Awareness of fishers concerning fisheries regulation	Yes	69.6
	No	30.4
Participated in workshop organized by fisheries managers	Yes	28.3
	No	71.7
Level of law fisheries law enforcement	Poor	41.3
	Good	2.2
	Very good	54.3
	Excellent	2.2
Sensitisation by fisheries managers at the landing beach	Yes	100

Table 5
Response of residents and non-residents on their awareness of beach management laws, perception of the state of beach resources, and knowledge of management organisation.

Questions	Response	Percentage of response (n = 14)
Awareness of laws concerning the management of beaches	Yes	64.3
	No	35.7
Perception on the state of beaches	Poor	50
	Fair	50
Knowledge of beach resource management organisation	Yes	71.4
	No	28.6

indigenous communities enshrined in law is non-existent although there are traditional institutions (chiefs, chief fishermen, and family elders) which use ancient beliefs (e.g., taboos) to regulate the activities of persons who use these resources. Although the Coastal Development Authority (CoDA) was recently established to oversee development in the coastal zone, a perusal of the Act establishing CoDA reveals a lack of provisions toward a long-term beach resource masterplan (including a beach clean-up manual) and the categorisation of beach (urban, peri-urban, rural, safety and water quality levels) to ensure sustainable utilisation of these resources through behavioural changes.

4.2. Strength, weakness, and opportunities with resource governance

4.2.1. Fisheries and beach governance

4.2.1.1. Strengths. Ghana's fisheries governance exhibits certain strengths (as illustrated in Table 2). These strengths encompass the presence of well-established policies, Fisheries Act, 625 of 2002 and Fisheries Regulations L.I. 1968 of 2010 (Fisheries (Amendment) Regulations L.I. 2217 of 2015), the presence of MoFAD and FC, informal institutions, and sensitised fishers (see Tables 3 and 4). The strength (see Table 2) in Ghana's beach resources governance and usage can be identified in its coastal policies [77], Beaches Obstructions Ordinance (CAP 240), state institutions with some jurisdictional responsibility, non-governmental organisations (NGO) and sensitised stakeholders (see Tables 2 and 5). When coastal and non-coastal respondents were asked, *"Do you know of any organisation(s) that controls the use of beach resources?*" Some responded by mentioning, "*Cape Coast Municipal Assembly*", "*Tema Metropolitan Assembly*" and some NGOs.

4.2.1.2. Weakness. The fisheries sector in Ghana is confronted with several weakness, which includes perceived corruption, weak enforcement of laws (see Table 4), inadequate staff, perennial technical and financial logistic constraints, the absence of research vessels, and inadequate data recording and monitoring capacities, particularly for the small-scale fisheries. These assertions were corroborated by fisheries managers (see Table 3). Several weaknesses persist in the management of beach resources, primarily due to the unavailability of specific policy directions (see Table 2) and a dedicated institution for beaches. Other weaknesses include inadequate consultations (see Table 5), laws (regulations), and coordination among the numerous authorised institutions responsible for the management of this resource.

4.2.1.3. Opportunities. The available opportunities (as outlined in Table 2) for the fisheries sector include the implementation of co-management measures by improving on the current Community-Based Fisheries Management Communities (CBFMCs) structures through appropriate legislation and logistical support. Demarcation of marine reserves as enshrined in the Fisheries Act 625 of 2002 and Fisheries Regulations, 2010 L.I. 1968. Furthermore, opportunities exist for reducing overcapacity in terms of the number of fleets, especially in the small-scale sector, from the current levels to a more sustainable number.

Opportunities exist in the reduction of fleet capacity (semi-industrial and industrial sectors), increasing the amount of fees for license renewal (i.e., meeting Target 3 of post-2020 Global Biodiversity Framework), extension of the close season period, provision of supplementary livelihoods to fishers and complete removal of subsidies. There are opportunities for the allocation of catch quotas in small-scale fisheries (e.g., based on the proportion of catch greater than length at first maturity of species, safety, etc.) and improvement on the current quota allocations for industrial fishers (through assessment of catch records of targeted species, fishers footprint, history of compliance, volume of bycatch landed, etc.) for a better understanding of the impact of each fisher to ensure sustainable management, similar to practices in the European Union. Opportunities (see Table 2) exist for the promulgation of extensive policies and regulations, and for improvement under the current institutional framework (i.e., CoDA being made the lead institution), to ensure adequate attention and sustainability of Ghana's beaches and their resources. There are also opportunities to establish sustainable zones and buffer areas (based on new or available scientific and local knowledge) along Ghana's beaches as a protective measure through the restriction of access to ensure a reduction in over-utilisation and guarantee their socio-economic and environmental (biodiversity and ecology) sustainability. Co-management with local traditional authorities (chiefs and family elders) as well as the establishment of Community Based Beach Management Committees (CBMCs) are options that are available to ensure judicious use and effective management. The opportunity of subscribing to the Blue Flag certification standard advocated by the Foundation for Environmental Education bearing in mind the use of an ecosystem-based approach also exists for Ghana's beach resource management. These measures can help increase sustainable local and national employment opportunities with accompanying revenues.

4.2.1.4. Threats. The Government of Ghana's continuous provision of input subsidies, including fuel (e.g., premix fuel and tax waivers amounting to about US$ 44 million annually), fishing nets and outboard motors (i.e., costing taxpayers over US$ 4.5 million annually). Coupled with the continuous partisan politicisation of resource and fishing communities, the persistent use of destructive fishing practices poses significant threats to the fisheries sector. Despite the prohibition of dumping of fish (discards) into the sea and without authorisation, these activities persist within the fishing industry due to budgetary constraints, and inadequate enforcement and threats to the management of the fisheries.

There are also threats arising from the continuous landing of gravid and juvenile fishes (as outlined in Table 2). Further threats include fishing within the 30 m depth contour by industrial fishers (a source of conflict between small-scale and industrial sectors) and effects of climate change. Competition for resources in shared fishing grounds amongst stakeholders as a result of dwindling wild stocks, continuous destruction of small-scale fishing gear by both semi-industrial and industrial fleets, conflicts between pro-illegal fishers and anti-illegal, fishers and enforcement agencies, leniency in the application of laws and regulations toward small-scale sector are all situations that threaten the effective management of the fishery. Ghana has a land tenure system in which tribal and ethnic groups, led by traditional rulers and family heads, have authority over the lands with their associated resources. The authority exercised by these leaders has always been a threat to the natural resource governance in the country of which beach resources are not exempted. Continuous activities such as sand and stone mining, pollution from effluents along the coastal zone, and unsanitary conditions (through open defecation, plastic and domestic waste disposal) (see Table 5), are additional threats facing beach resources in Ghana. There are also threats from the deforestation of beach vegetation (coconut trees and other plants), climate changes and sea level rise. Furthermore, there is another threat which is the continuous disregard for customary laws and beliefs, partially due to an increase in non-traditional religious beliefs. Hitherto customary laws and beliefs (a bottom-up approach) were effective in influencing behaviour and natural resource conservation, as individuals feared being punished by "god" or being summoned before the chief's palace or community leaders for nonconformity, which could result in fines or banishment from the society.

5. Discussion

Legal and institutional frameworks collectively contribute to the management of human behaviour in the utilisation of resources through decisions-making due to the essence of adequate natural resource governance [69,115]. The result of the analysis shows that Ghana, a signatory to the UNCLOS and FAO's CoCRF, as well as several others, including the sustainable development goals (SDGs), the African Union (AU) Agenda 2063 and Convention on Biological Diversity, has legal and institutional frameworks for fisheries and beach management. However, the effect of the current policy and management landscape on fisheries and beaches for decision-makers varies significantly, with a greater focus on fisheries contributing to the continuous imbalance of legal and institutional attention on beaches.

The protection and sustainability of natural resources enshrined in Ghana's national constitution (*Article 87(c), 269(1)*), which mandates the country's National Development and Planning Commission (NDPC) and governments to institute measures, have been implemented. These include policies and laws, which are central to the management system to ensures planning, management and access control, and prevention of conflict and pollution [95]. For instance, under the Fisheries Act 625 of 2002 and Fisheries Regulations (see Table 1), licenses and permits are required for all kinds of fishing fleets, fishing methods, and gears. Although measures such as selected gear types prescription have benefits, they also have challenges in multispecies fisheries management like Ghana for decision makers [8]. Limiting unrestricted access to fisheries and beach resources decreases anthropogenic activities and pressures, such as fishing mortality and discards (i.e., 9 million tonnes worldwide and thousands of tonnes in Ghana), coastal deforestation, pollution, sand mining and block moulding with dunes. Thereby improving the conservation of flora and fauna, aesthetics, and ensuring sustainable consumption and production patterns in alignment with SDG 12 and Goal 6 of AU Agenda 2063 [16,18,23,37,41,97].

Planning in natural resources governance is also essential for establishing the framework (i.e., closures, demarcating reserves and sensitive ecosystems) for sustainable utilisation [59,116]. Adequate scientific data is central to this [49], but the knowledge to back planning and the means of continuous data collection without, for example, dedicated research vessels for fisheries and scientific staff for beaches are detrimental. Ghana's marine fisheries often relies on a foreign research vessel like the RV Dr. Fritjof Nansen from Norway which is on a different mission in the Gulf of Guinea and does not venture in shallow areas of Ghana's marine waters, where most of the small-scale fishers operate leaving a significant data gap for decision makers [47,64]. Additionally, although there is cooperative scientific research with mainly industrial fleets (i.e., tuna and trawl vessels) and through the observer programme, it is fraught with challenges of data inaccuracies [53]. There is no beach planning under the current governance framework supported by scientific data, contributing to traditional rulers and family heads controlling the exploitation of the resources without direction, purpose, and formal approval from government institutions.

The marginalisation of activities of some groups (e.g., artisanal fishers and dune miners) by decision-makers due to their subsistence nature contributes to weaknesses and gaps in the resource governance regimes [33]. For instance, due to the economic vulnerability of artisanal fishers, enforcement of fishing, licensing and permit regulations is somewhat lenient [5,9,13,30]. Although *Article 65* of UNCLOS encourages states to enact stringent laws to regulate the exploitation of marine

mammals due to their significant roles in the structure and function of aquatic ecosystems [62]. Several empirical studies have recorded significant numbers in Ghana's fisheries as main catch or bycatch due to inadequate enforcement [25,83,117]. Interestingly, most of the fishermen interviewed expressed a favourable opinion of the current enforcement regime, while the managers believe it is a challenge (Tables 3 and 4). Additionally, due to weak enforcement, coastal residents openly defecate on the beach and cart away sand or mould blocks with dunes for construction purposes, which hurts the biodiversity (e.g., the decline in the population of ghost crabs and turtle nursery grounds) and the livelihoods of people in the area [27,32,57].

The current subsidy policy from central government is a major threat to the fisheries due to its contribution to excess capacity and overexploitation of resources [60]. For instance, due to the effect of fisheries subsidies on overcapacity and overexploitation, the quantity of fish caught by the small pelagic fishery in Ghana declined from over 138000 tonnes in 1996 to about 19608 tonnes in 2016, and the landing of fish species below the recommended minimum sizes continues in clear violation of the fisheries laws of Ghana, with consequences for the conservation targets [10,75,82].

Although there are challenges, several opportunities exist for the future, especially in the areas of marine protected areas, buffer zones, and enactment of modern beach laws under current dispensation, which can serve as incentives for the conservation of sedentary species, adult spawning stocks, turtles, juvenile fishes and dunes by reducing their vulnerability for long-term sustainability [45]. Fortunately, many coastal communities in Ghana already have some customary laws and structures in place where community leaders (i.e., chief fishermen, family heads and chiefs) have customary authority to regulate the activities and shape the behaviour of people [2,4,26,81]. These can be given legitimacy within the formal governance to ensure the active participation and effective conflict resolution because empirical studies suggests that, for instance, over 60 % of fishers would rather adhere to traditional tenets of fisheries management over government legislations [9,40,78,105].

6. Conclusion

In conclusion, the comprehensive analysis conducted in this research reveals policies that encourage sustainable fisheries utilisation but do not explicitly encourage sustainable utilisation of beaches by decision-makers. Consequently, the vast potential of beaches conservation to the socio-economy of Ghana remains untapped due to overlapping responsibilities, with an opportunity for short, medium, and long-term policy formulation to address current challenges.

The research underscores the significance of having an adequate legal regime and a coordinating policy and technical institution for fisheries and beach resources management to ensure the provision of essential baselines such as strategic planning, access control, conflict resolutions, and pollution control. Additionally, the research identified a raft of factors that collectively show the Strengths, Weaknesses, Opportunities, and Threats (SWOT) of the governance landscape of fisheries and beach resources, which decision makers must consider. These include established legal frameworks (laws), enforcement mechanisms, data deficiencies, overcapacity concerns, the predominant top-down management approach, the potential for amending existing legislation, and bolstering community-based management organisations through legal provisions and logistical support.

The policy and management gaps identified open the door for a comprehensive assessment of Ghana's marine and coastal resource governance where stakeholders, including decision-makers, researchers, politicians, and institutions, can work towards a more effective sustainable fisheries and beach resource management while aligning with global conservation (post-2020 Global Biodiversity Framework targets), sustainable development goals (SDGs) and Goal 6 of the AU Agenda 2063.

CRediT authorship contribution statement

Badr El Mahrad: Writing – review & editing, Visualization. **Cynthia Addo:** Writing – review & editing, Visualization. **John Essandoh:** Writing – review & editing. **Richard Takyi:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Francis Kofi Ewusie Nunoo:** Writing – review & editing.

Data Availability

The authors are unable or have chosen not to specify which data has been used.

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