



**Research Article**

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## Evaluation of sustainable management practices of water resources in Ghana: Perspectives from the Fosu and Essei Lagoons

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**Abstract**

Globally, nations have made decisions regarding sustainable management of water resources that have not always inured to the benefit of the populace. Some of these decisions have led to water bodies drying up, overdrawn groundwater aquifers, pollution, and in some cases, degradation in ecosystem services. This paper sought to evaluate and propose an efficient and sustainable management plan for coastal lagoon management to ensure

a more desirable future. Data were derived through the purposive sampling technique and snowball methods from all the key stakeholders considered having in-depth knowledge of Fosu and Essei Lagoons. The study showed overlaps in the management of the lagoons, which are perceived to be a missing link or overlap in the management and ownership. It has been identified that the interface/relationship between the ownership and management of the Fosu and the Essei Lagoons has been problematic. Ineffective decision-making mechanisms aimed at linking the expectations, skills, and experiences of all constituents (from civil society, the individuals and state organizations, as well as resident communities) have been developed. As a result, a bottom-up approach to coastal lagoon management in Ghana was proposed. Traditional authorities have been given the power to regulate or manage water resources in collaboration with other stakeholders such as the Environmental Protection Agency and Non-Governmental Organisations. In this case, scientific knowledge and traditional knowledge should be applied simultaneously or synergically to ensure the lagoons' sustainable use and management.

**Keywords** – Bottom-up approach, Fosu and Essei lagoons, Sustainable management, Traditional authority, Water resource management

### 1. INTRODUCTION

Efficient water management helps to avoid the recurrent discrepancy between, on the one hand, central government policies and goals and, on the other, the concerns and expectations of the people (UNDP, 2013). Water governance and community involvement attract attention to their role in designing and executing responses to major water concerns all over the globe. According to Megdal, Eden and Shamir (2017), water demand will rise by 55 percent by 2050 due to growing demand from production, thermal electricity generation, and domestic use (Akmouch, Clavreul, Hendry, Megdal, Ross, Nickum & Nunes-Correira, 2018). Controlling and guaranteeing access to clean

water for all is indeed not only a matter of resources but also that of effective governance. Syvitski, Kettner, Overeem, Hutton, Hannon, Brakenridge, Day, Vörösmarty, Saito, Giosan and Nicholls (2009) avers that a little over forty-four (44%) of the people around the world live within 150 kilometers of coastlines, indicating the importance of the coastal area.

There are varieties of use of the coast and coastal resources, and this serves as evidence of the importance of this zone. According to Hall (2001), one of the sectors with the highest growth around the coast is coastal tourism, and it is considered among the world’s largest industries contributing to both international and local economies. According to Abdullahi and Oyinlola (2020), water is one essential resource, either in natural or artificial forms, that is needed mine. A preliminary survey of some lagoons along the coast of Ghana has indicated that human activities such as sand mining, settlement expansion, wetland encroachment, urbanization, inputs of organic and inorganic nutrients from upstream, and fishing activities are having a negative impact on coastal lagoons. This has resulted in creating ecological pressure on the natural habitats of fish and other marine organisms living in and around them. With respect to environmental policies, these new governance processes and understandings are particularly prevalent, based on community consultation insights that have been central to the green movement (Matos & Dias, 2013). It is evident that the coast and coastal resources are subjected to competing usages. The diverse modifications to these coastal and marine resources affect the ecological integrity in myriads ways. In the same vein there are inadequate resources to satisfy the demand by man, these have increased the pressures placed on these marine and coastal ecosystem services via humans since the beginning of creation (Boateng, 2006), thus, accounting for the different competing users of the areas. The competing usage is demonstrated in Figure 1.



**Figure 1:** Competing users of coastal and marine resources

**Source:** (Boateng, 2006)

## 2. LITERATURE SURVEY

In sustainable development in the developing world, water governance plays a vital role. It is often reported that population explosion, socioeconomic growth, and innovation advancement have intensified water requirements; however, water supply has become increasingly unreliable, resulting from natural modifications and water management challenges. Water scientists and practitioners generally believe that strengthening water governance is essential for developing economies to address water insecurity. According to Norman and Bakker (2009), water resources management's discourse defines governance derived from the natural but not geographical boundaries and supports cross-sectoral strategies. This cross-sectional strategy included Integrated Water Resource Management (IWRM). Global Water Partnership (2000) defines water governance as a collection of political, social, economic, and

administrative bodies set up to establish and sustain water resources, as well as to provide public services at different community levels. The UNDP Water Governance Facility (2013) argues that principles such as efficiency and responsiveness throughout the mobilization and allocation of water supplies and facilities, water catchment management, the need for coordinated water management strategies and the need to address the socioeconomic use of water resources and the environment should be addressed, inter alia, by water governance.

The above definitions place the issue of water governance as collaborative efforts among different stakeholders to ensure the economic, political, and administrative management of water to ensure sustainability. It has been noted that several of the water management issues are more linked to mistakes in control than to their scarcity, demanding significant reforms tailored to the current and future perspective (Pahl-Wostl, Lebel, Knieper & Nikitina, 2012). In the process of facilitating the efficient use of water resources, it is therefore important to develop political, social, economic, and operational structures geared towards organizing and maintaining the water supply as well as the distribution of water supply systems across diverse levels of the value chain. The philosophical underpinning of the sustainable development concept is connected to economic growth and the environment. Water resources available through a deliberative process are managed by sustainable water governance in order to ensure a satisfactory and equitable level of social and economic wellbeing for people, taking into account future generations and environments (Wiek & Larson, 2012). First, to attain a continuous water supply, nations need to develop a very well-planned water distribution scheme at the national scale. Although upstream regions have strategic importance in retaining moisture for their hydroelectric power supply, downstream nations require flow stress for irrigation purposes, which further guarantees livelihood opportunities for Sixty percent of the region's population (Thắng, Tran & Luong, 2020). Stakeholders need significant improvements to their role at several levels as they transition from concept to practice. Entities and institutions willing to change can only implement a holistic approach to water management sustainably (Agarwal, delos Angeles, Bhatia, Chéret, Davila-Poblete, Falkenmark & Rees, 2000). The desire to reform should be fashioned in the context of the compliance with existing values by formulating justifications appropriate to all the concerned stakeholders.

## 2.1. Theoretical perspectives

### *Ecosystem Approach to Lagoon Management*

The ecosystem approach (EA) proposed under the CBD is an approach for the efficient development of land, water and biological assets. Enhances equal rights and reasonable use of the environment (Christensen, Bartuska, Brown, Carpenter, D'Antonio, Francis, Franklin, MacMahon, Noss, Parsons, Peterson, Turner & Woodmansee, 1996; Smith & Maltb, 2003). The good policies of "ecosystem-based management" highlight four basic elements that indicate that successful management must also be followed:

- 1) to be integrated between ecosystem components, resource uses and users;
- 2) contribute to improvement outputs;
- 3) exercise caution while ignoring detrimental actions, and
- 4) responsive in the search for more productive experiment-based strategies (Boesch, 2006; Yáñez-Arancibia, Dávalos-Sotelo, Day & Reyes, 2014).

### *The Driver-Pressure-State-Impact-Response Framework (DPSIR)*

DPSIR was first established for environmental accounting by the OECD (2002) and was again produced and modified to the sense of spatial planning by (Turner, Adger, Lorenzoni & Bateman, 1998). This system uses metrics to portray the string's components, thereby streamlining the knowledge generated in brief, clear instructions to diverse types of users and the project stakeholder, thus enhancing the accountability of decision-making (OECD, 2002). The Driver-Pressure-State-Impact Response framework was used by Odada, Crossland, Kremer, Salomons and Arthurton (2002)



to highlight the relationship between dual drivers and stressors of habitat destruction and production and their impact on the shoreline

### *Integrated Environmental Management*

The Integrated Environmental Management Framework (IEM) is among a variety of field-based policies and approaches for environmental conservation. IEM is founded on the notion that ecological systems of any magnitude or level ought to be operated in an integrated approach through cooperation and involvement of industries, stakeholders, and establishments (Margerum, 2002). The concept is a positive engagement and involvement among various characters that help build the cooperation and understanding of awareness required to solve global concerns. The participants are NGOs, government entities, the corporate industry, community-based organizations, and charitable institutions.

### *Integrated Coastal Zone Management*

The integration is in the form of stakeholder participation, legislation and technical guidelines, capacity building, and stakeholder empowerment. The loop begins with the national government, the district government, and the local or the coastal area. Information is shared among the various stakeholders, and this ensures decentralization of policies. A review of the past analysis by Sorensen (2002) found that there were approximately 700 ICM projects (including those at the community level) in more than 90 countries around the world in 2002. Integrated coastal management itself is marked by a conscientious policy framework (Cicin-Sain, Knecht, Knecht, Jang & Fisk, 1998) by which objective actions are made on the protection and efficient use of aquatic and marine assets (Krishnamurthy, Kannen, Ramanathan, Tinti, Glavovic, Green, Han & Agardy, 2008). The ICM phase is characterized as continuous and is implemented to promote that all activities and functions relevant to or concerning a nation's coastal region are appropriate. The measures often uphold the negotiated aims and outcomes of the area and the country as a whole.

The current paper is grounded or situated in the hybridisation of the environmental-related and water governance policy frameworks that are discussed above. The paper advocates explicitly for a bottom-up approach to lagoon management. In this context, local knowledge, skills, culture, and attitudes are incorporated into scientific knowledge in a coordinated manner. In this way, the locals will appreciate the experts' policies and protocols as they consider themselves as integral in the development of the policy and would employ every possible scenario to make it work effectively.

### **3. PROBLEM STATEMENT**

Data on freshwater resources in Ghana over the past two decades has shown that many initiatives have been undertaken to address the challenges that constrained the sustainable growth and development of the country's aquatic resources and streamline the role, function, and decision-making process within the sector. Studies have shown that some lagoons in Ghana are disappearing and others shrinking. Some have been heavily polluted, while others are expanding. Consequently, some of the lagoons' aesthetic values and their status as Ramsar sites are being lost (Aheto, Mensah, Okyere, Mensah, Kafui & Opoku-Agyarkwah, 2010). De Wit et al. (2001), who said that the hydro-geomorphological conditions of coastal lagoons are dynamic, have noted this observation. Over the last two decades, coastal lagoons have come under increasing anthropogenic and natural pressures (Amlalo & Ahiadeke, 2004). For example, urbanization and increasing population have contributed to further land reclamation and water demand that has resulted in the deterioration of water quality (Aheto et al., 2010; Boateng, 2008). Sustaining public interest and stakeholder participation in environmental issues will create opportunities for conserving and restoring areas that seek to provide the required ecological goods and services for the benefit of humanity.

The ability to monitor and manage future changes in coastal lagoons depends on an integrated understanding of the physical and biological conditions affecting the lagoon ecosystems (Kjerfve, 1994). This is because of the



remarkable changes in some of the lagoons along the central coastal plains of Ghana, particularly those in the urban areas due to the wastes from human activities thrown flow directly into the lagoons without any prior treatment. Again, traditional management systems on the Muni lagoon have come under intense pressure as the sacred grooves, laws, taboos, and other traditional practices are abused as a result of education and modernization (Adu-Boahen, Dadson & Atugbiga, 2018). From the above, sustaining public interest and stakeholder participation on environmental issues will create opportunities for conserving and restoring areas that seek to provide the required ecological goods and services for man's benefit. In addition, there is inadequate traditional management data and policies on the Muni lagoon. Careful evaluation of coastal habitats and coastal ecosystem changes is a crucial milestone for successful coastal ecosystem management and contributes to the sustainable use of coastal resources (Addo & Adeyemi, 2013). All of this could only be accomplished through the compilation of an accurate, reliable, and detailed set of conventional and scientific records. It is against this background that this paper sought to investigate and propose a sustainable conservation plan for the management of the Fosu and Essei lagoons in Ghana.

Thus evaluating stakeholders' views on possible future scenario strategies or case studies for the organization of water resources and recommendations for states, towns, communities, and experts on representing these possible futures in existing sustainable, valid water governance practices. The study's outcome will contribute to filling the research gap in the implementation of a multi-stakeholder engagement or bottom-up approach in lagoon management.

## 4. RESEARCH METHODOLOGY

### *Study area*

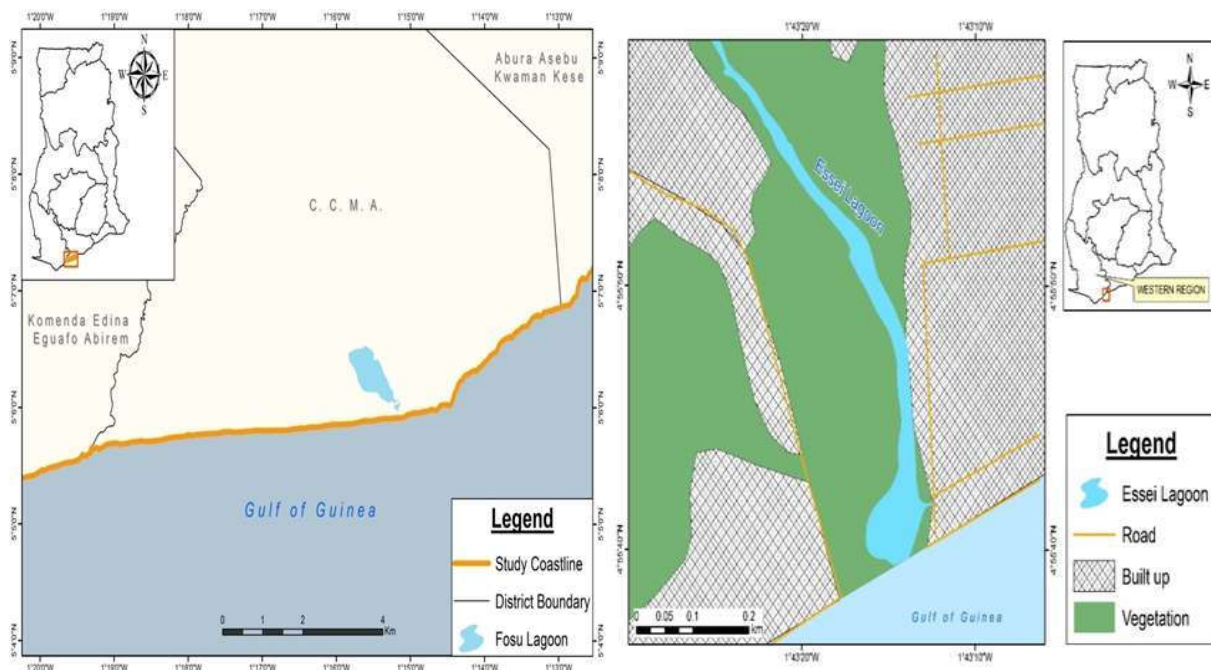
The research was performed in Ghana using the Fosu and Essei Lagoons. Both lagoons are found in the central coastal plain of Ghana and are located in urban communities with high population and its antecedent ramifications

### *The Fosu lagoon*

Fosu Lagoon is an urban water resource situated in Cape Coast, the capital of the Central Region of Ghana. The geographical coordinates of the lagoon are 5°07'N and 1°016'W. The Fosu lagoon is a shallow body of water that is separated from the sea by a sand bar (closed lagoon), which is sometimes broken by heavy rains or manually in connection with the rituals during the Fetu Festival in Cape Coast. The Fosu Lagoon is a significant water resource for Cape Coast residents because it provides both economic and cultural benefits. The amount of fish that live in the lagoon provides fishermen with some income and the people with protein. The artisans also use the mechanic shops along the lagoon as their livelihood. The lagoon also forms part of the Fetu festival celebrated by the people of Cape Coast.

### *The Essei lagoon*

The lagoon maintains a permanent opening into the sea because of anthropogenic perturbation (a fabricated open lagoon). The geographical coordinates of the lagoon are 4°054'N and 1°044'W. The lagoon is located in Sekondi-Takoradi, the people's capital town in the Western Region of Ghana and share boundary in the north with the Sekondi-Takoradi Metropolitan Assembly (STMA) road to the east is the Bakaakyir road and Bakaano road to the west. It is an urban lagoon with numerous human activities impinging on the ecological health of its resources. The study areas are shown in Figure 2.



**Figure 2:** Map of study areas in the regional and national context

**Source:** Fieldwork (2019)

### Methods

Several research methods were employed in order to provide a holistic perspective on the governance system. The methods included interviews, focus group discussions (fisher folks), document collections and analysis, field surveys, and historical document review. The combination of approaches has made it possible to examine the governance structure at various levels, ranging from personal skill to administrative and national levels. Qualitative evaluation of governance issues included key informant interviews with governance and non-government actors from various fields, including those who have been involved for many years and those more recently active in water resource decision-making. In order to validate baseline characteristics of the governing context in the study areas, key actors' interviews offered insights into the creation, negotiations, and development of the frameworks were essential (Okoro, Derbile & Angzagra, 2020). The study also included an in-depth survey of governance actors focusing on their governance participation, their experiences with other governance actors, and their views on how the structure has evolved over time. The data were collected within a six (6) months period.

### Social survey

The subject matter of the study is purely natural, and as such, onsite information was needed. Personal interviews and case histories were used to supplement onsite information. The purposive sampling technique and snowball method were employed to identify all the key members of whom to collect information as having had knowledge of the Fosu and Essei Lagoons, as shown in Table 1. They were purposively selected since they were able to give information about the challenges and management practices influencing the lagoons. Table 1 shows the various stakeholders involved in the lagoon management. The study solicited information from forty (40) respondents. The approach has led to a greater degree of confidence and collaboration than blind sampling approaches or broad formats of public meetings.

**Table 1:** Stakeholders Involved in the Management of Fosu and Essei Lagoon

Stakeholders	Sample
Environmental Protection Agency	5
Traditional Council	4
Forestry Commission	2
District Assembly	4
Fisher Folks	10
Non-Governmental Organisations	5
Coastal Zone Researcher Experts	5
Community Groups	5
<b>Total</b>	<b>40</b>

Source: Fieldwork (2019)

#### *Desk study /documentary and field surveys*

Global Positioning System (GPS), digital camera, tape measure were used in taking images and coordinates of significant features bordering the study lagoons. The study looked at potential physical, economic, regulatory, and social mechanisms that could be used in lagoon management to promote water conservation and effective management strategies based on the information needs and challenges identified by stakeholders and identified actors. The driver, pressure, state, impact and response (DPSIR) technique was applied by first assessing the changes that occurred in the study areas. Secondly, preliminary identification of driving forces by the researcher from the stakeholders was made through field surveys. Documentary and desk studies were also conducted on similar projects to identify the best conservation and management mechanisms by deploying secondary data sources (Chukwuere, 2020). The data from the IDI's were transcribed and categorized under specific themes and were used for further analysis and presentation. Data analysis was carried out on nodes to define concepts and explore patterns, themes, and definitions in the data by means of text and compound queries. This helped in drawing comparisons, similarities, and contrasting of information from the stakeholders.

### 5. DATA ANALYSIS AND DISCUSSIONS

Water governance challenges are consistently multifaceted. The profound objective is to maintain water legal frameworks that take account of and conform to social, economic, political and environmental situations dominated by volatility, transition and complexity. A thorough review and discussions with the stakeholders involved in water resources management in Ghana revealed a number of procedures and approaches to employ for efficient as well as sustainable management of lagoons. The results of these engagements are presented below.

**Table 2:** Situational analysis of the study lagoons on water governance

Policy	Very effective	Little effective
Education and Sensitisation		√
Empowering the Traditional and the Local Authorities	√	
Environmental Management		√
Legislation and Commitment of Stakeholders		√

Source: Fieldwork, (2019)

The presentation begins with a situational analysis conducted by the researcher to ascertain the state of water governance on the study lagoons. This situational analysis served as a prelude to having comprehensive knowledge on how stakeholders are collaboratively engaged in protecting these lagoons. It was realized that the lagoons has been considered a common pool or resources, and their management is bedeviled with a number of challenges. The challenges identified ranged from encroachment, discharge of waste, overfishing, and ownership problems between the traditional setup and municipal assemblies. Therefore, the study set out to elucidate information from stakeholders on the best practices in management and conservation for future generations and maintain the ecological health of aquatic resources. The approaches are discussed below.

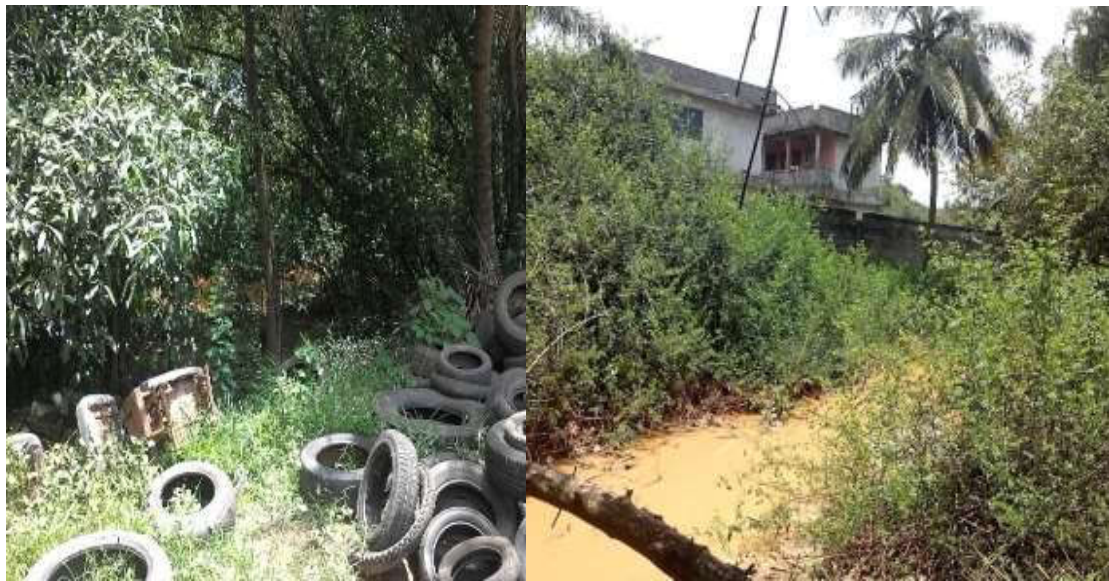
### *Education and sensitisation*

To ensure the sustainable management of lagoons, there is a need for education or sensitisation and dialogue to encourage local people to feel a sense of belonging and value the lagoons as a basis of their livelihood and survival. In order for people to show ownership of the Fosu and the Essei Lagoons and manage them well, government, civil society based organisations, academics and other national and international level stakeholders should begin to think like the local people. This could be an appropriate way to address the situation holistically with the intention that the people are likely to show ownership of the resource at their disposal. According to Steenson (2010), community members have quite a great deal of information about their community and count on it for their livelihoods, so their values, priorities and expectations should serves as the foundation of local government and be an essential component of the strategy formulation process.

*The stakeholders should understand our plight and think like us. One local participant remarked.*



**Plate 1:** Domestic Waste in the Fosu and Essei Lagoons



**Plate 2:** Domestic and industrial activities around Fosu and Essei Lagoons

**Source:** Fieldwork (2019)

The plates above call for sensitization and education of the resident population in the study area to be conscious of their activities and their ramifications on the lagoons. The continuous deposition and sedimentation into the lagoons will cause the loss of aquatic resources. Through education, residents will be well informed about the need to continuously safeguard the lagoons and their resources and desist from throwing car tyres, waste materials, and encroaching on the catchment of the lagoons.

#### *Empowering the traditional and the local authorities*

Coastal lagoon management in the case of the Fosu and Essei Lagoons is based on the traditional management approach where there is a traditional monarch, usually by descent in lineage, serving as custodian or guardian and the lagoon is controlled, managed, regulated, and monitored by taboos and outright bans and, in some cases, customary laws and practices. The analogy above resonates with the views expressed by Atampugre, Adu-Boahen, and Eshun (2016) and Agyenim and Gupta (2013) in their work on transboundary river governance in West Africa using the case of the Volta River system that showed, among other findings, that traditional management strategies are employed in managing rivers in Africa. Of course, education, religion, and modernisation as well as economic conditions, have now changed the paradigm on which this traditional management approach operated. The chiefs and the traditional leaders do not have power any longer as every individual considers the lagoons as common property. Hardin (2009) believed that natural assets kept in public are subject to massive destruction because they are used as though there were no limits. Hardin (2009) 's proposition is evident in the lagoon areas, as every individual, in some way, claims possession or ownership of the lagoons and decides on its usage in his or her own will and interest. This unstructured usage has degraded and polluted the Fosu and the Essei Lagoons. The degradation of the Lagoons is due to a lack of regulation on access to resources held as open.

*We have the custody of the land, our ancestors foretold us and we should be allowed to determine how it should manage and regulated. One traditional council member alluded.*



In certain instances, the catastrophe occurred only after established shared land or water supplies had been transformed, damaged or lost because of cultural interaction processes. Hardin (2009) argues that the users of the commons are trapped in an irreversible phase leading to the demolition of the resources on which they rely. According to Berkes (1989), as well as Feeny, Berkes, McCay and Acheson (1990) popular assets (public pool) materials share two features:

Ostrom, Dietzt, Dolsak, Stern, Stoninch and Weber (2002) identify four major types of public or common property rights. They are

- 1) Open access. It is free and open to every individual, therefore there is free access
- 2) Private property. The ownership is bestowed on a person or a company and they have an exclusive right to the property.
- 3) State property. The rights belong to the government or solely owned by the state
- 4) Communal property. The resources are owned and shared by a group of users.

In the Fosu and the Essei Lagoons, the open-access regime where access to both is free without any restrictions is evident. The residents and other users determine when and how to use the Lagoons for their own benefits. It must be known that these four systems are desirable forms of analysis. In reality, properties are commonly kept in blended configurations of asset-rights regimes. The current research on the status of the Lagoons revealed a missing link in the sense that, the protection of the Lagoons is shrouded in the philosophy of the commons, thus the open regime and every individual claim ownership of the resource, making the management of the lagoons problematic. However, according to Feeny et al. (1990), there is an agreement that perpetuity is not feasible with regards to the public-access system and, as a result, resources are being exhausted under such systems. The issue of tragedy of the commons is relevant to the situation pertaining to the Fosu and the Essei Lagoons in Ghana. The commons regime becomes highly visible in the sense that various stakeholders always contest the ownership of the Fosu and the Essei Lagoons. Studies revealed that management organisations such as Ministry of Works and Housing, Water Resources Commission, Environmental Protection Agency, Forestry Commission, Traditional Council, metropolitan bodies, as well as NGOs performed poorly due to several challenges relating to capacity for operation, financial and technical capacities, as well as logistical constraints.

National plans and conventions are ineffective in protecting resources that are local in scale. Several groups use the mangrove area and coastal resources as local commons. There was pervasive ignorance and mismatch on the management of the lagoons (Cash, Adger, Berkes, Garden, Lebel, Olsson, Pritchard and Young, 2006). The crucial task, throughout this case, might be the unwillingness of the society to enforce its laws on the lagoon end-users. The implementation of restrictive legislation is inadequate; the lack of legal attention, engagement and structures for inter-level cooperation has restricted the capacity of the key parties to contribute to local governance. Inadequate funding, commitment and logistics at the regional level management within the catchment area of the lagoons. It's imperative to take that into account the group stage is also critical as a starting point for resolving the catastrophe (Ostrom et al., 2002). Conversely, higher levels of organization are indeed essential for the provision of supervision, evaluation, compliance and support for local administration.

### *Environmental management*

Changing physical features and conditions along the lagoons need to be monitored and regulated, and to introduce prosecution into the environmental management system because education requires such reinforcement. Despite significant education/awareness-raising, people are reluctant to change their attitudes and behaviour towards the environment. In the case of the Essei Lagoon, there have been several restoration programmes such as the erection of signboards and employment of coastal guards to alert, educate and arrest offenders. Concerning the Fosu Lagoon, there is a tripartite committee, which seeks to monitor and manage the lagoon. Yet, this effort has not yielded the



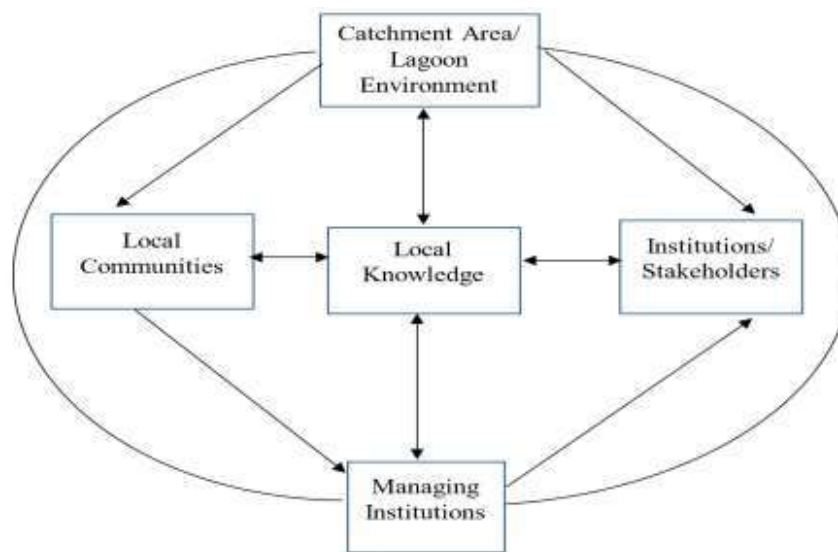
desired results and there is a call by residence for offenders to be prosecuted as part of the measures to restore the lagoon.

***Legislation and commitment of stakeholders***

Current research reveals that current management systems are inefficient to support the protection and management of coastal lagoons in Ghana, as there is lack of funds, logistics and personnel to enforce the policies. There is a lack of interest and poor attitude on the part of the government and other stakeholders. The local people flout legislation and regulations since any organisation or institution does not punish them. Some of this lack of enforcement can be put down to lack of financial support from the government (for example, for routine vehicle maintenance, and payment of casual workers). This lack of funding can extend for nearly two years. There is, therefore, the need to bring all stakeholders on board in a participatory manner, under the leadership of the local residents to facilitate restoration plan of the Fosu and the Essei Lagoons. Again, national, regional and international environmental pressure groups should join in the call for the restoration of all polluted lagoons in Ghana. Offenders who pollute the environment through indiscriminate defecation, dumping of refuse and other industrial waste should be arrested and prosecuted to serve as a deterrent to others. There is also the need to empower the local residents to lead the crusade for the restoration of the lagoons, thereby making the residents serve with commitment and zeal as local champions. The legislation should be able to ensure the existing local rules and regulations are duly enforced. Government funding is critical.

***Proposals for future scenario strategies for managing water resources: A bottom-up approach***

A sustainable management plan for the preservation and restoration of the Fosu and Essei Lagoons is proposed. This new proposed plan is based on a bottom-up approach that is integrated into nature and has the local residents at its core. The need for management solution to the factors causing the changing dynamics of the Fosu and the Essei Lagoons is essential (Figure 3). This solution is enshrined in the Ministry of Environment, Science, Technology and Innovation (2014) of Ghana. The policy goal is to help these people adapt to the emerging insights and new technology in the field of environmental protection. Its aim is to control the environment and to sustain society as a whole. The approach takes assessment of the current global sustainability model, which focuses on coordinated and structured resource stewardship, and strive to ensure the overall quality of life and our ecosystem. It also seeks to ensure reasonable access to environmental resources, a more productive use of social, cultural, resources, involvement of the community and leadership of the surroundings. In order to guarantee an interconnected bottom-up approach to coastal lagoon management, decision makers and aquatic policy analysts should use and incorporate approaches including the ecosystem-based management (EBM), integrated coastal zone management (ICZM), community-based management and many more. The blending should take into account local knowledge around which policy formulation and decision-making revolve.



**Figure 3:** Proposed Bottom-Up Approach to Coastal Lagoon Management

**Source:** Authors Construct (2019)

The ownership and management of the Fosu and the Essei Lagoons are not clear and it is problematic in nature. Hence, the incorporation of these local content knowledge, (interests, skills, perceptions, and values of the local people) has been indicated to be low or non-existent in the current management strategies (top-down approach) of the lagoons. It was opined by residents that if they identify with the decisions, they would accept them and enforce its compliance by the various users of the lagoon. This, they reiterated, as building consensus among the various users and interest groups in lagoon management. The Government of Ghana recognizes the need to incorporate environmental issues into social, political and economic equity in order to ensure the successful maintenance of the country's natural resources. This is reflected in the Ministry of Environment, Science, Technology and Innovation (2014), which indicated that such core values are the central tenets that would be implemented by State to direct action, including policy formulation, making of laws and enforcement. The new management approach will take into account the pivotal roles played by local knowledge which is represented by the traditional authorities in most jurisdictions. In this context, the values, interests, aspirations and decision making processes of the residents, who are the first to experience the effects of any environmental injustices, are taken into consideration. The framework is expected to work taking cognisance of the institutions or stakeholders.

This could be done by improving planning; implementation, monitoring and evaluations at all levels of the economy are among the processes through which the coastal zone could be managed effectively and sustainably. Due to the multifaceted nature of the coastal zone, there is a need for policies prepared by both local and central governments and other stakeholders taking the beliefs, skills and aspirations of the local people into account. There is also a need to have a strategy that provides a balanced and long-term strategic management framework for the integrated and ecologically sustainable use of lagoons. There is a need to generate the latest scientific information, combined with community and stakeholder feedback, to develop coastal lagoon management plans that originate from the local people. The primary purpose is to describe whom, can do what, how and where. When this is done, it will help other public authorities and communities, in general, to address priority management issues over a defined implementation period. For the institution and stakeholders to effectively work, there is a need for a laid down strategy on how each of the managing institutions is expected to do and at what stage is their mandate supposed to be curtailed.



### *Catchment area/lagoon environment*

The study revealed transformation of the lagoon environment from one dominated by wetland and coastal scrub and mangroves to an urban, industrial and agricultural land. In addition, the lagoon environment has been polluted, in the case of the Essei Lagoon in Sekondi-Takoradi due to the absence of adequate storage and treatment facilities in the area. Domestic and industrial wastes are mostly directed into the lagoon. These activities and others have affected the catchment area of the lagoon and hence there is a need for resettlement of the garages along the lagoon. The health of the environment should also be sustainably maintained by reducing the stressors in the environment. This could only be achieved when the local communities show greater ownership and responsibility. Resource use and management conflict should also be monitored and curtailed in the catchment area. Human behaviour ought to be regulated because of their tendency to affect and disturb biological cycles (Stenson, 2010). The physical environment can also be reflected as a whole and the marine areas has a complex relationship among several interdependent processes.

### *Local communities*

Due to the multifaceted nature of the coastal environment, integration among the local communities must be encouraged to stimulate the realisation that the lagoon and its resources are common property and hence should be managed in a coordinated manner. In this regard, the communities along the lagoons and its surrounding areas should have a common goal of sustainably utilising the resource to guarantee something for future generations. Community members must also play a critical role in all facets of the project management, from the preparation and selection of shared priorities to the planning and coordination phases. Inclusion of the residents at the various stages is an attempt to stress the value placed on local knowledge, memory and interests. This could be in the form of formation of vigilante/volunteer groups, employment of locals as guards and others. This will place the local people at the heart of the project lifecycle and let them take centre stage of the planning and implementation process.

### *Managing institutions*

At the core of the framework is managing institutions. Ellsworth, Hildebrand and Glover (1997) take the view that the division of duties across different spheres of implementation and sector - specific structures seriously limits the capacity to implement coastal problems. This is because the strategy would not promote the joint control of the coastlines. The approach normally focuses on the space with absolute disregard to the people and hence fail to address the cultural, social, economic as well as the environmental needs and aspirations of the people. The notion expressed above reflects the characteristics of most top-down approaches to coastal zone management. Local people are not involved in the project initiation or planning, implementation, monitoring and evaluation. Top management members have the sole priority to formulate and implement the policies.

The proposed framework is in direct contrast to the views expressed above as this framework is expected to give the opportunity to the local people whose livelihoods are dependent on the coastal environment and are made the integral or the centre of attraction in decision making. Ellsworth et al. (1997) are of the view that local groups seldom have the ability to influence decisions that could affect them; their perspectives are scarcely acceptable to those in authority. The effectiveness of the roles of local people is reflected in their role in the development of coastal management plans. When local people are engaged in this way, it contributes to greater public ownership and transparency, since the planned projects incorporate everyone from the start to the finish. It is at this level that their interests, opinions, knowledge and values are brought on board. The local knowledge is also considered as an significant component which provide input across small-scale management and the immediate community.

### *Traditional/local knowledge*



Traditional authorities should be legally protected in their implementation of traditional rules and conventions in order to maintain an effective control structure. The current structure tends to portray the power play between the stakeholders in the management of the lagoons. Hollings and Gunderson (2002) consider that local knowledge is the expertise produced by analyses of the surrounding environment. In this context, the local knowledge is expected to rest on the traditional authorities and the stakeholders in the various communities and their roles and involvement should reflect the embodiment of the local people as a whole. Since community members have a sufficient significant responsibility to conserve and use coastal resources sustainably, they should have real incentives, resources and conservation opportunities for marine environments around them. This means the local people should be engaged to use their traditional management practices to conserve and manage the lagoons.

The following are the strategic arrangements for improving the quality of the lagoons as espoused by the stakeholders involved in the study.

- 1) Resettlement of mechanic shops;
- 2) Periodic water parameter analysis;
- 3) Periodic stakeholder meetings;
- 4) Monitoring pressures on coastal ecosystems;
- 5) Evaluating community use of the coastal lagoons; and
- 6) Managing risks to public safety and built assets.

All these activities should be undertaken in consultation with the local communities. This will ensure consensus building and creation of trust among the various stakeholders. The expectation is that stakeholders share ideas and discuss case studies on improving strategic directions. The interaction among these stakeholders should be all-encompassing and roles assigned to each of the stakeholders. By so doing, the diverse groups would understand their schedule and may be able to evaluate themselves appropriately. This will prevent conflict of interest and confrontation in the sense that each group of people knows what is expected of them at the period of evaluation. When this occurs, the local people will feel part of the process and be involved as they participate at each level of the process, thereby encourage ownership and the urge to safeguard the resource. The local people should be given the opportunity to take an active part in all the deliberations at each level of planning (Figure 4). This is to prevent the perceived intricate conflict between the district assemblies, traditional authorities, NGOs and CBOs, researchers, academics, residents and other users.



Figure 4: Strategic Plan for Institutions/Stakeholders

Source: Field Data (2019)

## 6. RESEARCH IMPLICATIONS

The paper has shown the need to initiate discussions on public awareness and participation by improving linkages among schools, colleges, universities and the public, in the form of environmental education. Again, clear and specific roles should be assigned the various stakeholders in water resources management, as the existing framework and regulation do not explicitly provide such a guideline. Though the EPA, ACT, (2001) mandate the EPA as the custodian and regulatory body to oversee the environment and water resources. Such environmental education programmes should also be encouraged to improve commitment, since public commitment is an essential aspect of any conservational practice. The EPA, educational institutions and researchers could initiate these programmes of restoration and awareness creation. While awareness alone does not always alter attitude, the provision of the required empirical knowledge on the importance of mangrove swamps to fish stocks is paramount. The usefulness of the recovery programs to fishermen in the study areas as a whole would also prove a huge responsibility towards helping to restore fishing in the lagoon and improving the quality of life of the lagoons. The numerous garages at Siwdu in Cape Coast and along Fosu Lagoon and the Essei Lagoon in Sekondi and the palm kernel extractors at Adisadel village in Cape Coast should be resettled by city authorities (CCMA and STMA) to prevent the deposition of metal waste and domestic waste into the lagoons. The study also recommends resourcing of institutions by the central government in terms of logistics, finance and personnel. This will go a long way to ensure efficient and effective monitoring and management of the lagoons.



## 7. CONTRIBUTIONS TO SCIENTIFIC COMMUNITY NAD FUTURE RESEARCH

The research has contributed to knowledge in two ways. First, it has added to the stock of literature on coastal zone management, therefore, researchers in this specialty and students can consult this document to improve their understanding of CZM, particularly on management perspective. Secondly, the study has contributed to environmental policy, in the form of proposing a framework that could help manage coastal lagoons in Ghana and by extension to the whole world in the form of academic writing. The bottom-up approach to lagoon management is therefore recommended for managing lagoons in Ghana and globally. In this arrangement scientific and local knowledge are incorporated in lagoon management and the views and aspiration of the locals are integrated in the discourse.

## 8. CONCLUSION

The study revealed two main groups of managing institutions, and they are direct and indirect managers. The direct managers are the local communities who live within the lagoons' catchment areas, whilst the centralized managing institutions such as the Environmental Protection Agency (EPA), Wildlife Commission, Water Resources Commission, and Metropolitan Assemblies, and others. Form the indirect managers. Law compared to the Muni lagoon, which is protected by the Ramsar Convention, does not protect the Fosu and the Essei Lagoons. The Essei Lagoon, for example, is public property and is supposed to be maintained, secured, and kept in confidence by the local government for the citizens, whereas the Fosu Lagoon is not clearly established and may be regarded as a mixed tenancy among public property, tradition or stool land reserved for festive purposes, such as the yearly Fetu Afahye. The ownership and management of the lagoons are therefore not precisely categorized. With the choice for a bottom-up approach to lagoon management, it is expected that roles are assigned and management and tenure status as well as protection status established for the various lagoons.

The key finding regarding governance and management of the two lagoons was that the interface/relationship between the ownership and management of the Fosu and the Essei Lagoons were problematic; there is a 'missing link' or an over-lap. There were ineffective decision-making processes that seek to connect the interests, knowledge, and experiences of all stakeholders (from civil society, the private and public sectors, as well as local communities). The incorporation of the local content knowledge (views, ideas, local knowledge, customs, traditions, skills, and many others) was low or non-existent in the management strategies on the Fosu and Essei Lagoons. When local people come out to formulate their decisions, they will accept them and enforce compliance by various users of the lagoons. The existing management plans are not sustainable and effective due to all parties' lack of commitment: the government and other Fosu and Essei Lagoons users.

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