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Power Asymmetries and Participation Gaps in Inland Water Governance: Towards Adaptive Co-Management at Eleyele Lake, Nigeria

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Abstract

Sustainable management of inland water bodies depends on the active involvement of diverse stakeholders whose livelihoods and interests are directly tied to these resources. This study assessed stakeholder perceptions of participation in the governance of Eleyele Lake, Ibadan, Nigeria, with the objective of identifying power asymmetries, governance gaps, and pathways for more inclusive management. Data were collected between February and August 2018 through a questionnaire survey of 98 respondents; comprising fishermen, fish traders, government agencies, local businesses, religious groups, and recreational operators, supplemented by participatory appraisal tools. Stakeholder analysis employed a participation matrix, an importance–influence grid, and institutional Venn diagrams to map relationships, dependencies, and decision-making power. Perceptions of participation were evaluated using Likert-scale measures of being informed, consulted, and involved, with high internal consistency (Cronbach's = 0.96). Findings reveal that fishermen and women fish traders, though highly dependent on the lake, fall into the "high importance–low influence" category, while government agencies dominate decision-making despite capacity constraints. Only 20% of respondents reported feeling adequately informed, 7% consulted, and 5% actively involved in governance. A chi-square test (² = 56.12, df = 4, p ¡ 0.001) confirmed significant associations between stakeholder group and perceived participation, underscoring the marginalization of primary users. Shared challenges particularly aquatic weed proliferation and pollution; emerged as entry points for collective action. The study concludes that institutionalizing participatory platforms and multi-stakeholder committees within an adaptive co-management framework is essential to move from symbolic inclusion toward genuine power-sharing. Embedding inclusive governance in lake management will not only strengthen ecological sustainability but also enhance livelihood security and community resilience.

Keywords: Adaptive, Governance, Aquatic, Community, Institutional, Management

INTRODUCTION

Stakeholders are broadly defined as individuals, groups, or institutions with a vested interest in, or who are directly affected by, the outcomes of resource management (Wutich et al., 2020). In natural resource governance, meaningful stakeholder participation is increasingly recognized as fundamental to sustainable management and governance legitimacy (Jeffrey, 2009). This recognition reflects a shift from hierarchical, top-

down models to participatory frameworks that emphasize inclusivity, dialogue, and adaptability. Such approaches integrate diverse ecological knowledge and perspectives, enhance trust, and foster compliance, as individuals are more likely to support policies, they have helped shape (Roldan et al., 2019).

The advantages of participation extend beyond improved decision-making. Inclusive engagement builds accountability, strengthens enforcement through community buy-in, and enhances the legitimacy of governance arrangements (Jeffrey, 2009). However, participation is not evenly distributed. Stakeholders are commonly classified as primary, those directly dependent on the resource, such as fishers and traders, and secondary, such as government agencies, NGOs, or investors, whose influence may shape governance outcomes without direct reliance (Wutich et al., 2020). While equitable collaboration between these groups is desirable, power asymmetries frequently restrict the voices of primary stakeholders, limiting the effectiveness of governance (Roldan et al., 2019). Stakeholder analysis thus becomes vital for clarifying actors' interests and capacities to engage effectively.

Eleyele Lake in Ibadan, Nigeria, provides a compelling context for examining these issues. Constructed in 1942 as a reservoir for water supply, the lake has since evolved into a multi-use system supporting fishing, sand mining, smallholder agriculture, recreation, and regional water provisioning (Bolaji, 2010; World Bank, 2016). Despite its significance, the lake faces persistent challenges, including aquatic weed proliferation, pollution, and recurring user tensions (World Bank, 2016). These challenges not only threaten ecological integrity and socio-economic sustainability but also reveal the consequences of weak and uneven stakeholder engagement.

Although numerous studies on Nigerian inland waters have addressed ecological conditions or technical management, relatively few have systematically examined how stakeholder participation and its absence, shapes governance outcomes. Eleyele Lake, given its multi-use character and history of governance challenges, offers a unique opportunity to investigate these dynamics. Assessing how different groups perceive their roles and influence in management is essential for identifying gaps between dependency and decision-making power, and for highlighting opportunities to integrate community voices into institutional processes. The novelty of this study lies in its integration of stakeholder analysis and adaptive co-management into a single framework for inland water governance in Nigeria, thereby addressing a critical gap in both research and policy practice.

In response, this study evaluates the nature and quality of stakeholder participation in the management of Eleyele Lake. It is guided by the hypothesis that inclusive governance fosters ownership and strengthens sustainability, whereas exclusion breeds apathy and weakens institutional effectiveness. The study therefore aims to: (i) identify the key stakeholders involved in the lake's use and management and assess their influence in decision-making; and (ii) examine stakeholders' perceptions of their participation levels to reveal barriers and opportunities for more inclusive and effective governance. Ultimately, the study seeks to highlight strategies for strengthening stakeholder participation as a means of ensuring the sustainable management of the lake's resources.

Conceptual Framework

Contemporary scholarship views participation as a continuum of engagement rather than a static, one-off activity (Sanders-Thompson et al., 2021). This continuum spans four progressive levels:

• Information-sharing (one-way communication),
• Consultation (two-way exchange without decision power),
• Collaboration (shared decision-making),
• Empowerment (stakeholders exercising control over decisions and resources).

This continuum is closely aligned with two influential models widely applied in envi-

ronmental governance: Arnstein's Ladder of Participation and Pretty's Typology of Participation (FAO, 2003; Mefalopulos, 2008; Gaber, 2019). Both emphasize the gradation of stakeholder involvement, from passive forms of engagement to active and influential participation. These frameworks are particularly relevant in natural resource governance, where higher levels of participation; especially collaboration and empowerment; tend to yield more sustainable and legitimate outcomes by addressing power asymmetries between primary and secondary stakeholders (Gaber, 2019).

Extending this perspective, the concept of adaptive co-management integrates participatory governance with learning-oriented and flexible management approaches. It emphasizes that governance arrangements must evolve in response to ecological feedback, shifting stakeholder priorities, and emerging challenges (Berkes, 2010; Armitage et al., 2009). Adaptive co-management highlights not just inclusion in decision-making, but also the creation of iterative, trust-based processes in which policies and practices are continuously refined through joint experimentation, monitoring, and knowledge co-production.

In this study, Arnstein's Ladder, Pretty's Typology, and adaptive co-management jointly serve as analytical lenses. While Arnstein and Pretty help classify and diagnose degrees of participation, adaptive co-management stresses the need for flexibility, feedback, and institutional learning. Taken together, they provide a comprehensive conceptual foundation for assessing the inclusivity, effectiveness, and adaptability of stakeholder engagement in the governance of Eleyele Lake. Figure 1 illustrates this framework. It depicts a progression from the Continuum of Participation (information to empowerment) through Arnstein's Ladder and Pretty's Typology (tools for diagnosing levels of engagement), culminating in Adaptive Co-Management, which emphasizes flexibility, iterative learning, and trust-building. The three layers together show how participation in inland water governance can evolve from passive inclusion to genuine empowerment and adaptive governance.

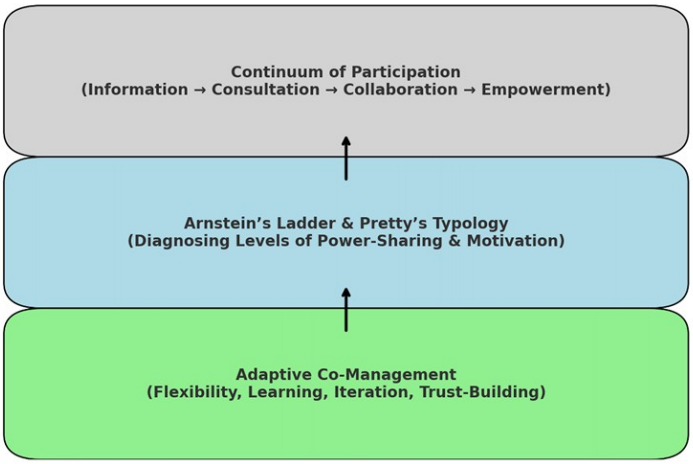

Figure 1: Linkages in the Conceptual Framework: From Participation to Adaptive Co-management

METHODOLOGY

Study area

Eleyele Lake (Figure 2) is located in Ibadan, Oyo State, southwestern Nigeria. Geographically, the lake lies at approximately 7°25 N, 3°55 E. It was formed in 1942 when the old Western Region government

dammed the Ona River to create a reservoir for urban water supply (World Bank, 2016). The lake stretches about 2.4 km from the dam and covers an area of roughly 0.5 km² when at full capacity. During the peak of the rainy season, water levels can reach about 9 meters in depth, indicating significant storage capacity for both water supply and flood control purposes. The lake and its environs support a variety of activities. The lake was created by damming a river and is used for fishing, water supply, and other livelihoods. it is the only man-made lake in the Ibadan metropolis and has historically been an important fishery for local artisanal fishermen. A kayak training school also operates on the lake, reflecting its recreational potential. The lakeshore hosts a small teak plantation and several small-scale industries (for example, a plastic recycling workshop and an iron-working/welding shop), taking advantage of resources like water and electricity infrastructure near the dam. There are also local businesses such as restaurants and eateries around the lake, which cater to residents and visitors, and community institutions including a church and a horticultural farm that uses lake water for irrigating plants. The diverse uses of Eleyele Lake mean that multiple stakeholder groups interact in this space, sometimes harmoniously and sometimes with friction. In recent years, challenges such as aquatic weed overgrowth have been reported – water hyacinth and other weeds cover portions of the lake's surface, impeding fishing and boating activities. There are also concerns about waste disposal and water quality, as nearby refuse dumps and runoff can introduce pollution, leading to foul odors and health hazards for those using the water (World Bank, 2016; Olayinka et. al. 2017). These issues underscore the need for coordinated management. Effective management of the lake requires coordination among diverse stakeholders, including local users and government agencies. However, the degree to which different stakeholders are involved in managing or mitigating such problems remains unclear and is the focus of this study.

Figure 2: Eleyele Lake in Ibadan, Nigeria.

This study, conducted between February and August 2018, employed a socio-economic survey and stakeholder analysis approach to evaluate participation in the management of Eleyele Lake. Data were collected through a structured questionnaire supplemented with participatory appraisal tools. A total of 98 respondents were interviewed, selected through random sampling within a 500-meter radius of the lake, which served as the sampling frame. This boundary was chosen to capture individuals and institutions most directly affected by, and engaged with, the lake's ecological and socio-economic functions. The sample size was considered adequate for repre-

senting stakeholder diversity while remaining manageable for participatory exercises, consistent with similar small-scale natural resource governance studies (Reed et al., 2009).

The questionnaire combined closed-ended items, which enabled quantitative comparisons across respondents, with open-ended questions, which generated qualitative insights into perceptions of governance and decision-making. Participatory tools; including the participation analysis matrix, importance–influence matrix, and institutional Venn diagrams were implemented through one-on-one and small-group sessions. Larger group facilitation was not feasible due to logistical constraints and the heterogeneous schedules of respondents, many of whom were engaged in daily livelihood activities. Conducting participatory tools in smaller sessions allowed for deeper engagement, ensured inclusiveness, and maintained methodological rigor. Triangulation was achieved by comparing survey responses with participatory outputs and validating findings across sessions, thereby strengthening the reliability and robustness of the analysis.

In addition to assessing participation and influence, the study also examined stakeholders' perceptions of conflict resolution mechanisms in lake governance. Questions were designed to capture how disputes were typically resolved; for instance, whether disagreements were settled informally within the community, through peer consultation, or via formal institutions; without probing the specific types of conflicts.

Stakeholder Analysis Tools

Three main stakeholder analysis tools structured the investigation:

1. Participation Analysis Matrix A participation analysis matrix was employed to provide a structured assessment of stakeholder roles and engagement in the governance of Eleyele Lake. This tool documented each group's characteristics, interests, resources contributed or utilized, problems encountered, and actions they recommended, offering a comprehensive overview of how stakeholders interact with and depend on the lake (Smith, 2000; Devarani & Basu, 2019). The matrix served three key functions. First, it captured the heterogeneity of stakeholder groups, ranging from primary users to secondary and peripheral actors. Second, it revealed the linkages between dependence and challenges faced, demonstrating how ecological stressors translate into economic and livelihood vulnerabilities. Third, it enabled the comparison of stakeholder perspectives, highlighting areas of convergence and divergence. By systematically mapping these dimensions, the participation matrix established a diagnostic baseline of stakeholder engagement, clarifying both their current level of involvement and their aspirations for deeper participation in lake governance. This provided an essential foundation for analyzing governance gaps and exploring opportunities for inclusive adaptive co-management.

2. Importance–Influence Matrix Each stakeholder group was assessed in terms of two parameters: their importance to sustainable management of the lake (related to their dependence on the resource) and their influence on decision-making. Stakeholders were mapped into four categories (high importance–low influence; high importance–high influence; low importance–low influence; and low importance–high influence) following Bendtsen et al., 2021. A hybrid scoring procedure was employed. Importance scores were derived from survey responses in which stakeholders rated their reliance on the lake using a five-point Likert scale (1 = very low; 5 = very high). Influence was assessed through a combination of researcher-assigned indicators; such as statutory authority, control of resources, and technical capacity and stakeholder perceptions of relative power. Triangulation reduced bias and captured both formal authority and locally perceived influence (Reed et al., 2017). Scores were plotted and categorized into four quadrants, providing a systematic lens to identify governance imbalances between high-dependence but low-

influence groups and institutionally dominant actors. This tool highlighted imbalances between dependency on the lake's resources and decision-making power.

3. Institutional Venn Diagrams The institutional Venn diagram, also known as the chapatti diagram, was employed to visualize the relationships and linkages among stakeholders and institutions involved in the governance of Eleyele Lake (Feed the Future, 2014). In this tool, each stakeholder was represented by a circle, with the size of the circle denoting relative importance to lake management and the degree of overlap reflecting the strength of interaction or collaboration (Townsley, 1993). The positioning and overlaps were not solely researcher-assigned but were indicated directly by respondents during participatory exercises, ensuring that the diagram captured stakeholders' own perceptions of institutional relationships. This process clarified how different actors see their roles, how closely they interact with others, and where gaps in collaboration exist. By systematically mapping these dynamics, the Venn diagram functioned as both a descriptive tool and an analytical framework. It revealed the distribution of institutional presence, patterns of engagement, and areas of weak linkage, while providing a basis for identifying opportunities to strengthen collaboration. In doing so, it offered insights into institutional strengths and shortcomings, supporting the development of more inclusive and adaptive governance arrangements for the lake.

Measurement of Participation Perceptions

Stakeholders' perceptions of their participation in lake governance were assessed through a Likert-scale evaluation designed to capture progressive levels of engagement. The instrument was structured around Pretty's typology of participation, which distinguishes between passive, consultative, and interactive forms of involvement (Pretty, 1995). Respondents were asked to indicate their level of agreement with statements using a three-point scale (Agree = 2, Neutral = 1, Disagree = 0).
The items addressed three dimensions of engagement: • The first focused on being informed, with the statement: "I am well informed about management decisions regarding Eleyele Lake." This represented the most basic level of participation, where stakeholders primarily receive information. • The second dimension assessed consultation, through the statement: "Stakeholders like me are usually consulted about management issues around Eleyele Lake." This captured a more active form of participation, reflecting a two-way exchange but without decision-making authority. • The third item evaluated involvement, framed as: "Stakeholders actively take part in the management process of Eleyele Lake." This represented higher-level participation aligned with functional or interactive decision-making. By combining these items, the survey provided a quantitative measure of perceived participation, spanning from passive information-sharing to active involvement. The approach allowed for systematic comparison across stakeholder groups and offered insights into both the extent and quality of engagement in governance processes.

Data Analysis

Survey responses were analyzed using both descriptive and inferential statistics.
• Descriptive statistics (frequencies, percentages, cross-tabulations) were applied to summarize demographic characteristics, occupational structures, and stakeholder perceptions.
• Reliability testing: The three Likert-scale items on participation were tested for internal consistency using Cronbach's alpha, which produced a value of 0.96. This indicates excellent reliability (Tavakol & Dennick, 2011) and justified combining the items into a single Participation Index (range 0–6).
• Chi-square test of independence: To examine the association between stakeholder category and participation level (low vs. high, based on the index), Pearson's Chi-square

test was performed.
• Thematic analysis was applied to open-ended responses, enabling interpretation of stakeholder-identified problems, interests, and recommended actions.

Results and Discussion

Stakeholder Groups and Demographic Characteristics

1. Identified Stakeholders:
The study identified a range of stakeholders actively engaged with Eleyele Lake, either through direct resource use or management roles. Key stakeholder groups include:
• Fishermen (artisanal fishers who operate on the lake),
• Fish mongers and processors (typically women who buy fish from fishermen and handle processing or marketing),
• The Oyo state water corporation (the government agency managing the dam and water supply infrastructure),
• The Oyo state department of fisheries (responsible for fisheries regulation and support),
• A kayak training school (offering recreational use of the lake),
• The state forestry department (due to nearby plantation and watershed concerns),
• Local small-scale industries (such as a plastic recycling workshop and an iron welding shop located near the lake),
• Local restaurant owners (running eateries by the lakeside), • A local church (which occasionally uses the lake for activities like baptisms),
• A horticultural farm (using lake water for irrigation of plants).
These groups encompass both primary stakeholders (e.g. fishermen, fish traders, local businesses directly reliant on the lake) and secondary stakeholders (e.g. state agencies who influence lake management on behalf of the public).
2. Demographic Profile of Respondents: A summary of the social characteristics of the survey respondents is presented in Table 1. Out of the 98 individuals interviewed, 61% were male (n = 60) and 39% female (n = 38). This gender distribution reflects the gendered division of roles commonly observed in small-scale fisheries and inland water systems. All the fishermen surveyed were men (no female fishers were observed during the study), whereas all fish mongers/processors interviewed were women. This pattern aligns with findings from other studies in Nigeria and sub-Saharan Africa, where men dominate capture fisheries while women are concentrated in post-harvest processing and marketing (Harper et al., 2020; Kleiber et al., 2014). Other stakeholder roles showed mixed participation: government workers included both men and women, plastic recycling was operated by both genders, while restaurant owners and church members in the sample were predominantly women.

a) Occupational Structure Occupationally, fishermen constituted the largest group of respondents (27.6%), followed by fish mongers/processors (21.4%). Government workers (The Oyo state water corporation, department of fisheries and the state forestry department) accounted for 11.2%, while plastic recyclers represented 10.2%. Smaller proportions were engaged as welders (6.1%), church members (6.1%), restaurant owners (5.1%), kayak school operators (4.1%), and horticulture farmers (8.2%). This distribution underscores that fishing and fish trading remain the backbone of livelihoods directly tied to Eleyele Lake, while government employment, artisanal work, and small-scale enterprises complement the socio-economic fabric of the community.
This occupational pattern reflects the global understanding of fisheries-dependent communities, where livelihoods are often diversified but anchored in fishing and fish trade (Allison & Ellis, 2001; FAO, 2010). The strong reliance on capture fisheries and related activities at Eleyele is consistent with observations in other Nigerian contexts, where inland water bodies serve as critical livelihood hubs (Olopade et al., 2017; Agbeja et al., 2021).

b) Age Distribution The respondents' ages ranged from young adults to elders, reflecting a broad generational spread within the community. Although the data did

not disaggregate ages by stakeholder group, the overall profile shows that a significant proportion (46%) were middle-aged (31–50 years), placing many respondents in their most active and productive working years. Younger respondents (16%) were in the 21–30 years range, while an equal proportion (16%) fell within the 51–60 years category. The remaining 22% were above 60 years, comprising veteran fishermen, longtime farmers, and community elders with extensive knowledge of the lake.

This distribution suggests that Eleyele Lake's user community benefits from both youthful labor and intergenerational continuity. Middle-aged respondents represent the workforce that sustains day-to-day fishing, trading, and associated activities, while older participants carry decades of accumulated ecological and management experience. Such traditional ecological knowledge (TEK) has been recognized as a valuable asset in small-scale fisheries worldwide, often complementing scientific assessments in understanding ecosystem dynamics and guiding sustainable practices (Berkes, 2017). Harnessing the perspectives of both younger and older generations provides opportunities for blended governance approaches; the energy and innovation of younger stakeholders combined with the experiential knowledge of elders could strengthen resilience, improve compliance with regulations, and enhance community-based management strategies.

c) Marital Status and Household Dependence In terms of marital status, the majority of respondents (62%) were married, while 14% were single and 24% were widowed or divorced. These patterns are consistent with the age profile, as most respondents were within family-raising stages of life. Many married stakeholders reported that their households depend directly on lake-related livelihoods. This underscores the social and family-level importance of the lake's resources, as they support not only individual incomes but also broader household welfare. Similar findings in West Africa confirm that the sustainability of fisheries resources is directly tied to food security, poverty reduction, and community well-being (FAO, 2020; Bene and Heck, 2005).

d) Implications for Governance

Taken together, the demographic characteristics portray a community that is predominantly middle-aged, family-oriented, and heavily reliant on lake-based occupations. Respondents benefit from the lake both directly—through fishing, trading, farming, and artisanal activities—and indirectly, through water supply, spiritual use, and local employment. However, the gendered division of labor indicates that men and women experience governance differently: men are more affected by fishing effort, licensing, and ecological sustainability, whereas women are more impacted by market access, price volatility, and processing infrastructure. These differentiated roles underscore the need for inclusive governance that integrates both men's and women's perspectives. Previous studies show that neglecting women's roles in post-harvest handling and marketing weakens fisheries policy, despite their central contributions to household nutrition and market efficiency (Kleiber et al., 2014; Harper et al., 2020; Adam et al., 2021). Similarly, the community's dependence on fishing and fish trade exposes them to risks posed by ecological stressors—such as weed infestation and pollution—or governance gaps, as these directly threaten household welfare and local economies (Agbeja et al., 2021). Despite differing perspectives, all stakeholders share a common dependency on Eleyele Lake, creating a strong rationale for adaptive co-management. This approach emphasizes collaborative decision-making, iterative learning, and flexibility, enabling governance arrangements to respond dynamically to ecological change and social needs. By integrating stakeholder voices through participatory platforms, adaptive co-management can strengthen ecological sustainability, social legitimacy, and resilience in the governance of Eleyele Lake (Reed et al., 2018; Eaton et al., 2021).

Table 1: Social Characteristics of Respondents from the Study Area

Characteristic	**Category**	**Male (n)**	**Female (n)**	**Total (n)**	**Percentage (%)**
Occupation	Fishermen	27	0	27	27.6
Occupation	Fish mongers/processors	0	21	21	21.4
Occupation	Government workers	9	2	11	11.2
Occupation	Kayak school operators	4	0	4	4.1
Occupation	Plastic recyclers	6	4	10	10.2
Occupation	Iron works/welding	6	0	6	6.1
Occupation	Local restaurant owners	0	5	5	5.1
Occupation	Church members	2	4	6	6.1
Occupation	Horticulture operators	6	2	8	8.2
Occupation Total		60	38	98	100.0
Age Range	21–30 years	12	4	16	16.3
Age Range	31–40 years	13	8	21	21.4
Age Range	41–50 years	17	7	24	24.5
Age Range	51–60 years	9	7	16	16.3
Age Range	61 years and above	9	12	21	21.4
Age Range Total		60	38	98	100.0
Marital Status	Single	9	5	14	14.3
Marital Status	Married	37	24	61	62.2
Marital Status	Divorced/Widowed	14	9	23	23.5
Marital Status Total		60	38	98	100.0

Importance, influence, and interactions of stakeholder

As part of the stakeholder analysis, we examined how each identified stakeholder group performs in terms of their importance to the lake ecosystem and management versus their influence in decision-making processes. Table 2 presents a Participation Analysis Matrix summarizing each stakeholder's interests, contributions, problems, and suggested actions, and Figure 4 conceptually illustrates stakeholders on an importance-influence grid.

a) Interests and Problems of Stakeholders: The analysis of stakeholder groups around Eleyele Lake reveals both shared concerns and distinct priorities. While all groups expressed a common interest in the sustainable use of the lake, their specific interests, resources, problems, and suggested actions varied according to their roles and dependencies (Table 2).

i) Primary Users:

• Fishermen and Fish Mongers/Processors

Fishermen remain the most directly dependent on the lake, prioritizing increased fish catch and livelihood security. Their main constraints include weed infestation, seasonal fluctuations, and license costs and these mirror challenges reported in Nigerian inland fisheries (Olopade et al., 2017; Agbeja et al., 2021). Their proposed solutions, such as joint weed removal and improved dam operations, reflect recognition that ecological interventions require collective action. Fish mongers and processors, predominantly women, emphasized a stable fish supply and affordable prices. As shown in Table 2, their vulnerability to inconsistent supply and post-harvest losses aligns with broader African experiences (Harper et al., 2020; Kleiber et al., 2014), underscoring the need for gender-responsive interventions.

• Oyo State Government Agencies: Water Corporation and State Fisheries Department and Forestry Department.

The Water Corporation emphasized challenges related to maintaining water quality, particularly the proliferation of aquatic weeds that clog intakes and disrupt treatment processes, compounded by budgetary constraints that limit consistent control efforts. The State Fisheries Department underscored gaps in fisheries governance, including inadequate data collection and weak monitoring, control, and surveillance

(MCS) capacity; issues widely reported across Nigeria's inland fisheries (FAO, 2020; Andrew Evans, 2011). The Forestry Department's stake derives from its responsibility for watershed protection and plantation management surrounding the lake, with a focus on curbing deforestation, erosion, and land-based sources of sedimentation and pollution that threaten water quality and aquatic habitats.

Despite their distinct mandates, these agencies share overlapping concerns and all stressed the importance of stronger interagency collaboration: the Water Corporation prioritizing weed management, the Fisheries Department seeking co-produced data and fisherfolk compliance, and the Forestry Department focusing on upstream land-use practices that influence lake health. Such cross-sectoral coordination reflects global evidence that integrating ecological knowledge, regulatory mandates, and local participation leads to more effective management outcomes (Berkes, 2010; Djenontin Meadow, 2018).

ii) Secondary and Peripheral Stakeholders

o The kayak school, though a small actor, stressed the recreational and ecotourism potential of the lake, but this depends on weed-free, navigable waters. Local businesses such as plastic recyclers and welding operators were less directly concerned with ecological problems, though their operations may contribute to waste and pollution. Their limited awareness reflects challenges in engaging peripheral users in environmental governance (Bavinck et al., 2018).

o Restaurants and church groups raised sanitation concerns, particularly refuse dumping and bad odors, which diminish both commercial viability and spiritual uses of the lake. This highlights how environmental degradation has cross-cutting effects, undermining not just economic activities but also community cohesion and cultural practices.

o Horticulture farms valued irrigation access, reporting few immediate problems but recognizing that water pollution or weed encroachment could jeopardize operations. This group underscores the multipurpose nature of the lake, supporting both fisheries and agriculture.

iii) Cross-Cutting Issues

Several challenges emerged as shared concerns across multiple stakeholder groups:

o Aquatic Weed Infestation: Reported by fishermen, processors, water managers, recreational users, and religious groups, this emerged as the most pervasive challenge affecting Eleyele Lake. The weeds not only obstruct fishing operations and recreational activities but also clog water intakes, thereby reducing efficiency in water management. They further exacerbate sanitation problems by contributing to foul odors and degraded water quality. Given its cross-cutting impact, aquatic weed infestation represents a critical entry-point issue where collective action could generate immediate and visible benefits. For instance, the fishermen engaged in manually slashing weeds, demonstrating both the urgency of the problem and the potential for community-led interventions to complement institutional efforts.

o Sanitation and Waste Management: Restaurants and church groups emphasized refuse and odor problems, but this also indirectly affects tourism, water quality, and community health. Weak municipal waste services amplify the problem, highlighting the need for governance linkages between fisheries, water management, and local government.

o Governance and Capacity Gaps: Agencies (Water Corporation, Fisheries, Forestry) stressed limited resources, inadequate data, and enforcement challenges. These mirror broader governance gaps in Nigeria's inland fisheries (FAO, 2020; Jentoft et al., 2018). A notable institutional weakness is the absence of a formal lake management council, which leaves coordination fragmented and stakeholder voices insufficiently represented in governance processes. Without such a platform, interactions between agencies remain ad hoc, and opportunities for systematic community participation are limited. This gap reinforces the need for cross-sectoral integration and highlights the potential of adaptive co-management as a

governance pathway. Establishing a multi-stakeholder council could provide an institutional anchor for aligning agency mandates with community-based practices of consultation and conflict resolution, thereby embedding flexibility, inclusiveness, and iterative learning in the governance of Eleyele Lake.

iv) Conflict Resolution

Across all stakeholder groups, conflicts were primarily resolved through informal consultation with neighbors and peers, without recourse to higher authorities. Respondents emphasized the effectiveness of these localized mechanisms in sustaining day-to-day harmony, though some noted their limitations where power asymmetries persist. This reliance on informal resolution, underscores the need for governance models that integrate community-based practices within more structured decision-making platforms. Adaptive co-management offers such a pathway, embedding trust-based resolution practices into participatory governance frameworks.

v) Implications

These cross-cutting problems reveal both the urgency and potential of multi-stakeholder action. Shared vulnerabilities such as aquatic weed proliferation and waste pollution can serve as entry points for trust-building and adaptive co-management, where agencies bring technical expertise, regulatory authority, and infrastructure, while communities contribute labor, local knowledge, and compliance. Adaptive co-management emphasizes not only joint problem-solving but also the creation of flexible and learning-oriented governance arrangements that can evolve in response to ecological and social change (Berkes, 2010; Armitage et al., 2009). In this way, local practices of consultation and informal conflict resolution can be embedded within broader institutional frameworks, enhancing inclusiveness and legitimacy. Evidence from similar settings shows that aligning diverse interests around shared problems and iteratively adjusting governance strategies is an effective way to transition toward participatory and adaptive governance (Pretty, 1995; Berkes, 2017; Onyango & Jentoft, 2020).

b. Importance vs. Influence

Using stakeholder information, groups were plotted on an importance–influence matrix (Figure 3). This framework highlights the extent to which each group depends on Eleyele Lake (importance) and their ability to shape its governance (influence). The results reveal significant imbalances, consistent with natural resource governance literature that often identifies power asymmetries between primary users and state actors (Reed et al., 2009; Jentoft et al., 2018).

• High Importance – Low Influence

The fishermen (1) emerge as the most critical group in this quadrant. Their livelihoods are directly dependent on the lake's fisheries, and they possess substantial ecological knowledge built over decades. Yet their influence on formal decision-making remains minimal, echoing patterns across African inland fisheries where resource users are central to sustainability but marginalized in governance (Onyango & Jentoft, 2010; Agbeja et al., 2021).

The kayak school (2), fish mongers (3), and restaurant owners (4) also occupy this space. While their dependence is less pronounced than that of fishermen, they remain vulnerable to management outcomes that affect fish supply, recreation opportunities, and the cleanliness of the lake environment. Women fish traders, in particular, illustrate a gendered dynamic: they are economically vital but often excluded from governance spaces (Kleiber et al., 2014; Harper et al., 2020). The Forestry Department (5) also falls into this quadrant. Its importance lies in its mandate for watershed and plantation management, since land-use practices around the lake influence sedimentation, erosion, and weed growth. Yet forestry issues are rarely prioritized in lake governance, leaving the department with limited influence despite its ecological relevance.

• High Importance – High Influence

Government agencies, namely the Water Corporation (6) and the State Fisheries Department (7), dominate this quadrant. Their importance derives from statutory

mandates: the Water Corporation manages the dam and ensures water supply, while the Fisheries Department oversees regulation and sustainability of fisheries. Both wield significant influence through control of infrastructure, budgets, and enforcement mechanisms. However, capacity constraints remain; like, weed management challenges for the Water Corporation and data/monitoring gaps for the Fisheries Department, these echoing broader institutional limitations in Nigeria's natural resource governance (FAO, 2020; Andrew and Evans, 2011). Their dominance reinforces a top-down governance model, where community voices remain secondary.

• Low Importance – Low Influence

Peripheral actors such as the horticultural farm (8), plastic recyclers (9), ironworks/welding operators (10), and church groups (11) fall within this quadrant. Their direct importance to lake sustainability is limited, and their influence in governance is negligible. Nevertheless, their activities generate indirect pressures such as pollution from industrial waste, refuse dumping, and sanitation challenges noted by other stakeholders. These actors exemplify the "hidden pressures" that often remain unmanaged when governance narrowly focuses on fisheries and water supply (Bavinck et al., 2019).

• Low Importance – High Influence

No stakeholders clearly occupied this quadrant. Typically, it may include external political actors or higher-level government institutions that can influence decisions through funding or policy mandates without being directly dependent on the lake. Their absence from this survey suggests a limitation of the stakeholder mapping exercise, as such "invisible" actors can nonetheless shape management outcomes (Reed et al., 2017).

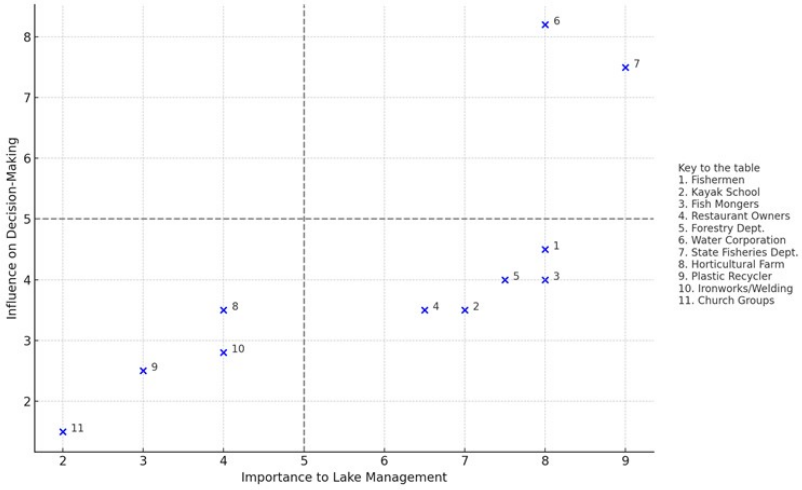

Figure 3: Importance and Influence Matrix

c. Stakeholder Interactions

The stakeholder interactions around Eleyele Lake are summarized in the Venn diagram (Figure 4). The diagram illustrates the degree of overlap between key actors, thereby revealing the extent of their collaboration, communication, and influence in lake governance. • Government–Government Interactions The Water Corporation, State Fisheries Department, and Forestry Department show the closest linkages, represented by overlapping circles. This suggests that the three agencies coordinate to some extent, for example, during environmental assessments, dam operations, or discussions on watershed management. Their overlap also reflects their shared membership within the state government structure, which likely fa-

cilitates information exchange at higher administrative levels. Such coordination, however, tends to remain bureaucratic and top-down, consistent with observations that natural resource agencies in developing contexts often engage more with each other than with local users (Reed et al., 2009).

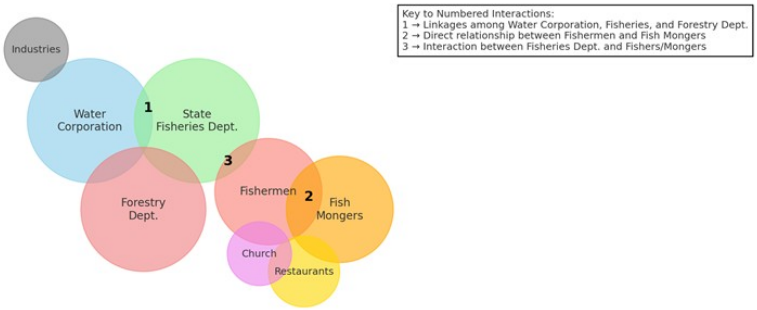

Figure 4: Stakeholder Interactions in Eleyele Lake Management

• Community–Community Interactions Among community stakeholders, fishermen and fish mongers demonstrate strong interaction, as expected given their direct business relationship: fishermen provide daily catches that women fish traders process and sell. Their overlap highlights the interdependence of production and trade in the local fish economy. These groups also interact with the Fisheries Department in the form of licensing, regulation, and occasional conflict resolution. Yet, the overlap between community actors and government agencies is smaller than that observed among government entities themselves, indicating that engagement between regulators and resource users is weak or unequal. This imbalance reflects broader findings in stakeholder analysis, where those most dependent on resources often hold the least influence (Grimble, 1998; Reed et al., 2009). • Peripheral Stakeholders Other actors; namely Restaurants and the Church & Industries group, are positioned as peripheral yet connected stakeholders. Restaurants source fish directly from fishermen and fish mongers, thereby sustaining the local value chain and providing a market outlet for daily catches. Similarly, church members not only purchase fish but also engage fishermen for lake access during spiritual activities such as baptisms, reflecting both economic and cultural linkages to the lake. The industries associated with the lake are largely small-scale enterprises (e.g., recycling, welding, and related trades). Although not directly involved in lake governance, these industries depend on the lake environment for their operations and contribute to local socio-economic dynamics. However, their activities also raise environmental concerns, particularly through pollution, which indirectly affects fisheries and water quality. The placement of these groups as peripheral actors underscores their minimal direct involvement in formal management structures, despite their dependence on the lake for livelihoods, consumption, or cultural services. Their interactions occur primarily through informal relationships and shared reliance on the fish trade, a pattern that reflects broader governance trends where non-traditional yet important users are often overlooked in favor of more conventional state–community arrangements (Bavinck et al., 2018)

• Absence of Coordinated Platforms A striking feature of the diagram is the absence of a central coordinating circle that brings all stakeholders together. In

well-functioning participatory systems, one would expect a large overlap representing multi-stakeholder committees or platforms where decisions are collectively negotiated. Instead, the Eleyele case reflects fragmented, disconnected interactions: fishermen primarily engage with fish traders, government agencies coordinate with one another, and peripheral actors remain isolated. This pattern places Eleyele on the lower rungs of Arnstein's (1969) ladder of participation, where informing and token consultation fall short of genuine empowerment. It also aligns with what Pomeroy and Rivera-Guieb (2006) describe as "low-level co-management", symbolic acknowledgment of local users without substantive power-sharing. • Implications for Governance Overall, the stakeholder analysis portrays a fragmented and unbalanced governance arrangement. Primary users such as fishermen and fish traders, who are central to the lake's sustainability, remain peripheral to decision-making processes. Government agencies retain control but appear under-resourced and do not effectively leverage community collaboration. Peripheral stakeholders, though dependent on the lake in different ways, are excluded from formal dialogue. These findings echo the wider literature on fisheries and natural resource governance, which emphasizes that meaningful co-management depends on institutionalized platforms that enable voice, power-sharing, and accountability (Berkes, 2010; Jentoft et al., 2018; Reed et al., 2017). Strengthening communication channels, establishing a multi-stakeholder management committee, and fostering partnerships between government, community groups, and peripheral actors could help bridge these gaps. Such platforms could transform the current fragmented interactions into a more integrated framework, enhancing compliance, building trust, and addressing shared challenges such as aquatic weed proliferation and pollution. Experiences from elsewhere reinforce this potential; for example, the Beach Management Units on Lake Victoria have shown how participatory governance can improve compliance and foster shared responsibility despite implementation challenges (Onyango Jentoft, 2007; Kanyange et al., 2014). Similarly, participatory forest management initiatives demonstrate how power-sharing can balance sustainability with livelihood needs (Berkes, 2017). In summary, the stakeholder analysis highlights a fragmented management scenario. While primary users like fishers remain crucial for sustainable use, they are marginalized in decision-making. Government agencies dominate but lack resources to act effectively, and peripheral actors are excluded from formal governance. There is thus an evident need for mechanisms to enhance communication, collaboration, and collective action around Eleyele Lake.

The survey assessed how stakeholders perceive their level of participation in Eleyele Lake's governance, focusing on three dimensions: being informed, consulted, and actively involved. Responses to the three Likert-scale items demonstrated excellent internal reliability (Cronbach's = 0.96), confirming that they measured a coherent construct of stakeholder participation (Tavakol & Dennick, 2011). Results are presented in Table 2.

Table 2: Stakeholders' Perceptions of Participation in Eleyele Lake Governance (N = 98)

Participation Dimension	Agree (n, %)	Neutral (n, %)	Disagree (n, %)	Interpretation
Informed (kept aware of decisions and issues)	20 (20.4%)	11 (11.2%)	67 (68.4%)	Majority not adequately informed about management issues
Consulted (asked for input on management)	7 (7.1%)	12 (12.2%)	79 (80.6%)	Very few respondents consulted before decisions
Participate (direct involvement in management processes)	5 (5.1%)	18 (18.4%)	75 (76.5%)	Active participation extremely limited

• Being Informed

Only about one-fifth of respondents (20%) felt they were adequately informed about management decisions concerning Eleyele Lake, while over two-thirds (68%) disagreed. Stakeholders often reported hearing

about regulatory changes or dam operations only informally, through rumors or observation, rather than through formal communication channels, signifying a substantial information gap.

This one-way communication reflects the nature of passive participation, which undermines stakeholder trust in governance processes (Arnstein, 1969). Similar challenges have been documented across African small-scale fisheries. For instance, in South Africa, small-scale fishers have historically been marginalized from formal governance structures and poorly informed about policy developments and their own rights (Sowman & Sunde, 2021). Additionally, participatory approaches in northern Zambia revealed that limited engagement and information-sharing eroded community trust and reduced the effectiveness of co-management initiatives (Kaluma et al., 2021).

• Being Consulted

Consultation was perceived as even weaker. Just 7% of respondents indicated they were asked for input before decisions were made, while over four-fifths (81%) disagreed. Most stakeholders recalled interactions with officials only during crises (e.g., flooding or fish kills) or research visits, but no institutionalized forum for dialogue exists. This once-in-a-while consultation mirrors findings in small-scale fisheries globally, where local ecological knowledge is rarely integrated into policy despite its recognized value (Reed et al., 2009; Jentoft et al., 2018). Women fish traders in particular reported exclusion, echoing widely observed gendered inequities in post-harvest governance (Kleiber et al., 2015; Harper et al., 2020).

• Active Participation

Direct involvement was virtually absent: only 5% reported playing an active role in management. Fishermen, processors, and small businesses emphasized that they had no seat at the table for planning or rule-making and were left to cope individually with ecological problems such as aquatic weed infestation. The absence of co-management institutions at Eleyele stands in contrast to other African contexts, such as Lake Victoria, where Beach Management Units (BMUs) have provided a platform for shared rule-making and enforcement (Onyango & Jentoft, 2010).

• Statistical Associations

The chi-square test revealed a statistically significant association between stakeholder group and perceived participation level ($\chi^2 = 56.12$, $df = 4$, $p < 0.001$). This quantitative finding reinforces the descriptive results presented earlier (Table 3), where only 20% of respondents felt adequately informed, 7% consulted, and 5% actively involved in Eleyele Lake's governance.

Government officials were the only group that consistently reported higher levels of consultation and involvement. In contrast, primary users such as fishermen (5 respondents), fish traders (2), and horticultural farmers (2) reported only minimal engagement, while small businesses including restaurants and local industries; reported no participation whatsoever.

This uneven distribution of participation reflects the persistence of a state-centric governance model, where government agencies dominate decision-making and community actors are included in largely symbolic rather than substantive ways. Similar dynamics have been observed across African inland fisheries, where state institutions often prioritize regulatory control and infrastructure management while sidelining the ecological knowledge and livelihood concerns of local users (Onyango & Jentoft, 2010; Béné et al., 2010; Ratner et al., 2013; Sowman & Sunde, 2021). Such superficial inclusion may legitimize state authority but undermines compliance, erodes trust, and weakens the legitimacy of governance outcomes (Cornwall, 2008; Kaluma et al., 2021).

At Eleyele, the chi-square findings confirm what both the participation matrix and qualitative accounts suggested; despite being highly dependent on the lake, fishermen and women fish traders remain marginal to decision-making, while state agencies retain disproportionate influence. This re-

inforces the need for governance reforms that establish inclusive mechanisms; such as multi-stakeholder management committees, to balance power, institutionalize dialogue, and ensure that those most affected by management outcomes have a meaningful role in shaping them.

5. Toward Inclusive Co-Management at Eleyele Lake The Eleyele case sits on the lower rungs of Arnstein's (1969) ladder of participation, where informing and token consultation do not amount to empowerment. It aligns with what Pomeroy and Rivera-Guieb (2006) describe as "low-level co-management," in which participation is largely symbolic. Such arrangements legitimize decisions without democratizing them (Cornwall, 2008; Ratner et al., 2013; Berkes, 2018).

Nevertheless, opportunities for collaborative governance remain. Aquatic weed removal emerged as a shared priority across all groups, suggesting an entry point for collective action. A coordinated program combining Water Corporation equipment, Fisheries Department expertise, and community labor could both address an urgent ecological challenge and build trust. This reflects participation's dual role: a means to better environmental outcomes and an end in itself, empowering communities (Pretty, 1995; Berkes, 2010).

A critical gap is the absence of an institutionalized stakeholder platform. Unlike other African contexts where Water User Associations or Beach Management Units (BMUs) have been established, Eleyele lacks a formal forum for joint decision-making. Establishing a Multi-Stakeholder Lake Management Committee would institutionalize dialogue, create accountability, and provide a space for rule-making, sanitation planning, and weed control (Coffey, 2005; Pomeroy et al., 2016). Anchoring this platform in an adaptive co-management approach would ensure it evolves with ecological change and community feedback, avoiding the pitfalls of static arrangements.

a) Stepwise Implementation Pathway

• Pilot Phase: Initiate small-scale collaborative projects, such as joint aquatic weed removal drives or sanitation campaigns. These pilots would require modest budgets—primarily in-kind contributions of equipment from the Water Corporation and technical input from the Fisheries and Forestry Departments, while communities contribute labor and local knowledge. A basic monitoring and evaluation system should accompany these pilots to document activities, track participation, and assess early outcomes, ensuring that lessons learned directly inform the institutionalisation phase.

• Institutionalisation Phase: Formalize the Lake Management Committee through local government by-laws and in alignment with national frameworks such as the Water Resources Act (2004) and the National Fisheries and Aquaculture Policy. This phase would require dedicated budget lines within Oyo State allocations to support committee operations, training workshops, and participatory monitoring and evaluation systems. These systems should include periodic reporting, feedback loops between agencies and communities, and performance indicators on ecological health, stakeholder participation, and governance effectiveness. Embedding M&E ensures transparency, builds accountability, and fosters adaptive decision-making.

• Scaling Phase: Expand the Lake Management Committee's mandate to address broader issues, including watershed protection, conflict resolution, and livelihood diversification. Universities, NGOs, and donor agencies could serve as neutral facilitators and co-financiers, supporting training, cross-learning exchanges, and independent evaluations to measure long-term impacts. At this stage, a comprehensive M&E framework should be institutionalized, combining ecological monitoring (e.g., water quality, biodiversity indicators) with social indicators (e.g., stakeholder satisfaction, equity of participation). Over time, the platform could evolve into a replicable model for other inland water bodies in Oyo State, with M&E results providing evidence for policy learning and scaling.

b) Institutional Roles and Budgetary Considerations Government agencies are already performing critical functions in the management of Eleyele Lake, but their activities remain fragmented and poorly coordinated. The Water Corporation of Oyo State currently manages dam operations and water supply infrastructure, the State Fisheries Department oversees monitoring, control, and surveillance (MCS), data collection, and fisherfolk extension, while the Forestry Department is responsible for watershed protection, erosion control, and upstream land-use regulation. These mandates are essential, yet stronger collaboration, integration, and coordinated monitoring and evaluation (M&E) under a unified governance framework are needed to achieve more effective outcomes.

To strengthen inclusiveness, fishermen's cooperatives, fish traders, recreational operators, and local businesses should be formally represented in a Lake Management Committee. Such a platform would create a structured space for dialogue, joint decision-making, and accountability between agencies and community stakeholders. An embedded participatory M&E system should track ecological indicators (e.g., water quality, weed proliferation), social outcomes (e.g., stakeholder satisfaction, inclusiveness of participation), and institutional performance (e.g., responsiveness of agencies). Funding for this body could begin with modest allocations from existing state budgets for water supply, fisheries development, and forestry conservation. Additional resources could be mobilized through public–private partnerships (PPPs), particularly for sanitation and eco-tourism initiatives, while universities, NGOs, and donors provide technical support, facilitation, and independent evaluations.

Barriers remain: government agencies face resource and staffing constraints, while communities contend with apathy, inequities, and power asymmetries. However, evidence shows that these challenges can be addressed through participatory training, gradual trust-building, and the demonstration of tangible benefits (Reed et al., 2018; Bavinck et al., 2019). Pilot activities such as collaborative weed removal or sanitation campaigns could serve as confidence-building measures and, with continuous monitoring and feedback, establish the iterative learning loops essential to adaptive co-management.

Experiences from elsewhere reinforce this potential. On Lake Victoria, Beach Management Units (BMUs) improved compliance and fostered shared responsibility despite challenges of elite capture and uneven enforcement (Jentoft et al., 2018; Onyango & Jentoft, 2020). Similarly, participatory forest management has demonstrated that power-sharing can balance ecological sustainability with livelihood security (Berkes, 2018). Together, these cases illustrate how adaptive co-management, supported by robust M&E, blends inclusiveness with the flexibility and responsiveness needed to govern dynamic ecosystems (Armitage et al., 2009).

In summary, the challenges of weed proliferation, pollution, and livelihood pressures at Eleyele Lake cannot be resolved through centralized management alone. A phased pathway toward inclusive adaptive co-management; anchored in Nigerian legal frameworks, supported by institutional budgets, reinforced by community participation, and strengthened through ongoing monitoring and evaluation; offers a realistic route to ecological sustainability, iterative learning, and enhanced community welfare.

REFERENCES

Adam, R., McDougall, C., Beveridge, M.C.M., & Marwaha, N. (2021). Advancing gender equality and women's empowerment in fish agri-food systems: Four pathways. Penang, Malaysia: CGIAR Research Program on Fish Agri-Food Systems. Program Brief: FISH-2021-10.

Agbeja, Y., Oluyede, E., & Oyedepo, V. (2021). Socio-economic char-

acteristics assessment and livelihood coping strategies of small-scale fisheries in Ogun waterside local government area, Nigeria. *International Journal of Fisheries and Aquatic Studies, 9*(2), 266–276.

Allison, E. H., & Ellis, F. (2001). The livelihoods approach and management of small-scale fisheries. *Marine Policy, 25*(5), 377–388.

Andrew, N.L., & Evans, L. (2011). Approaches and frameworks for management and research in small-scale fisheries (pp. 16–34). In Pomeroy, R.S. & Andrew, N.L. (Eds.), *Small-scale fisheries management: frameworks and approaches for the developing world*. CABI, UK.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Armitage, D., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., Diduck, A. P., Doubleday, N. C., Johnson, D. S., Marschke, M., McConney, P., Pinkerton, E. W., & Wollenberg, E. K. (2009). Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment, 7*(2), 95–102. https://doi.org/10.1890/070089

Bavinck, M., Jentoft, S., & Scholtens, J. (2018). Fisheries as social struggle: A reinvigorated social science research agenda. *Marine Policy, 94*, 46–52.

Bendtsen, E.B., Clausen, L.P.W., & Hansen, S.T.F. (2021). A review of the state-of-the-art for stakeholder analysis with regard to environmental management and regulation. *Journal of Environmental Management, 279*, 111773. https://doi.org/10.1016/j.jenvman.2020.111773

Béné, C., & Heck, S. (2005). Fish and food security in Africa. *Naga, The WorldFish Center, 28*(3/4), 8–13.

Béné, C., Hersoug, B., & Allison, E.H. (2010). Not by rent alone: Analysing the pro-poor functions of small-scale fisheries in developing countries. *Development Policy Review, 28*(3), 325–358.

Berkes, F. (2010). Devolution of environment and resources governance: trends and future. *Environmental Conservation, 37*(4), 489–500. https://doi.org/10.1017/S037689291000072X

Berkes, F. (2017). *Sacred ecology* (4th ed.). Routledge. https://doi.org/10.4324/9781315114644

Bolaji, G.A. (2010). Hydrological assessment of water resources and environmental impact on an urban lake: A case study of Eleyele Lake catchment, Ibadan, Nigeria. *Journal of Natural Sciences, Engineering and Technology, 9*(1), 90–98.

Cornwall, A. (2008). Unpacking 'participation': models, meanings and practices. *Community Development Journal, 43*(3), 269–283. https://doi.org/10.1093/cdj/bsn010

Devarani, L., & Basu, D. (2019). Participatory wetland management in Loktak lake: a road to sustainable development. *Journal*, 5, 182–194.

Djenontin, I.N., & Meadow, A. (2018). The art of co-production of knowledge in environmental sciences and management: lessons from international practice. *Environmental Management, 61*, 1–19. https://doi.org/10.1007/s00267-018-1028-3

Eaton, W. M., Brasier, K. J., Burbach, M. E., Whitmer, W., Engle, E. W., Burnham, M., & Weigle, J. (2021). A conceptual framework for social, behavioral, and environmental change through stakeholder engagement in water resource management. *Society & Natural Resources, 34*(8), 1111–1132. https://doi.org/10.1080/08941920.2021.1936717

FAO (2003). *Participatory Processes Towards Co-Management of Natural Resources in Pastoral Areas of the Middle East: A Training of Trainers Source Book Based on the Principles of Participatory Methods and Approach*. https://www.fao.org/4/ad424e/ad424e00.htm#Contents

FAO (2010). *Best Practices to Support and Improve the Livelihoods of Small-Scale Fisheries and Aquaculture Households*. RAP Publication 2010/21. https://www.fao.org/4/i1966e/i1966e00.pdf

FAO (2020). *The State of World Fisheries and Aquaculture 2020*. FAO, Rome. https://openknowledge.fao.org/server/api/core/bitstreams/170b89c1-79\\46-4f4d-914a-fc56e547\\69de/content

Feed the Future (2014). *Participatory Methods and Tools for Extension: Venn Diagram (Chapati Diagram)*. https://meas.illinois.edu/wp-content/uploads/2017/02/MEAS-Participa\\tory-Methods-Tip-Sheet\\-Venn-Diagram.pdf

Gaber, J. (2019). Building "A Ladder of Citizen Participation": Sherry Arnstein, Citizen Participation, and Model Cities. *Journal of the American Planning Association*, 85, 1–14. https://doi.org/10.1080/01944363.2019.1612267

Grimble, R. (1998). Stakeholder methodologies in natural resource management. Socio-economic Methodologies. Best Practice Guidelines. Chatham, UK: Natural Resources Institute. https://www.cbd.int/doc/pa/tools/Stakeholder

Harper, S., Adshade, M., Lam, V.W.Y, Pauly, D., Sumaila, U.R. (2020). Valuing invisible catches: Estimating the global contribution by women to small-scale marine capture fisheries production. *PLoS ONE*, 15(3): e0228912. https://doi.org/10.1371/journal.pone.0228912

Jeffery, N. (2009). *Stakeholder Engagement: A Road Map to Meaningful Engagement*. Doughty Centre 'How to do Corporate Responsibility' Series, Cranfield School of Management. 48pp. https://www.fundacionseres.org/lists/informes/attachments/1118/stake\\holder%20engagement.pdf

Jentoft, S., Onyango, P., & Islam, M. (2018). Freedom and poverty in the fishery commons. *International Journal of the Commons*, 4(1), 345–366. https://doi.org/10.18352/ijc.157

Kaluma, K., and Umar, B. B. (2021). Outcomes of participatory fisheries management: An example from co-management in Zambia's Mweru-Luapula fishery. *Heliyon*, 7(2), e06083. https://doi.org/10.1016/j.heliyon.2021.e06083

Kanyange, N., Kimani, P., Onyango, P., Sweenarain, S., Yvergniaux, Y. (2014). Performance As-

sessment of Beach Management Units Along the Coastlines of Kenya and Tanzania. *Indian Ocean Commission*. https://openknowledge.fao.org/server/api/core/bitstreams/2cbf6edb-ff\\a4-450c-ad63-a7afd617c\\1a0/content

Kleiber, D., Harris, L., and Vincent, A. (2014). Gender and small-scale fisheries: a case for counting women and beyond. *Fish and Fisheries*, 16: 547–562. https://doi.org/10.1111/faf.12075

Mefalopulos, P. (2008). *Development Communication Sourcebook: Broadening the Boundaries of Communication*. The World Bank. https://documents1.worldbank.org/curated/en/752011468314090450/pdf/446360Dev0Comm1ns0\\h\\andbook01PUBLIC1.pdf

Olayinka, O. O., Adedeji, H. O., Akinyemi, A. A., & Oresanya, O. J. (2017). Assessment of the Pollution Status of Eleyele Lake, Ibadan, Oyo State, Nigeria. *Journal of Health & Pollution*, 7(15), 51–62. https://doi.org/10.5696/2156-9614-7.15.51

Olopade, O.A., Taiwo, I.O., Dienye, H.E. (2017). Management of Overfishing in the Inland Capture Fisheries in Nigeria. *LimnoFish*, 3(3), 189–194.

Onyango, P.O. and Jentoft, S. (2007). Embedding co-management: community-based fisheries resource management regime in Lake Victoria, Tanzania. In Dickson, M. and Brooks, A. (eds.) *Proceedings of the CBFM-2 International Conference on Community Based Approaches to Fisheries Management*, Dhaka, Bangladesh, 6-7 March. The WorldFish Center - Bangladesh Office.

Pomeroy, R. S., & Rivera-Guieb, R. (2006). *Fishery co-management: A practical handbook*. CABI: Wallingford, UK. ISBN 978-0-85199-088-0.

Pretty, J.N. (1995). Participatory Learning for Sustainable Agriculture. *World Development*, 23, 1247–1263. https://doi.org/10.1016/0305-750X(95)00046-F

Ratner, B. D., Meinzen-Dick, R., May, C., & Haglund, E. (2013). Resource conflict, collective action, and resilience: An analytical framework. *International Journal of the Commons*, 7(1), 183–208. https://doi.org/10.18352/ijc.276

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C.H., Stringer, L.C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management*, 90(5), 1933–1949.

Reed, M. S., Vella, S., Challies, E., de Vente, J., Frewer, L., Hohenwallner-Ries, D., Huber, T., Neumann, R. K., Oughton, E. A., Sidoli del Ceno, J., & van Delden, H. (2017). A theory of participation: What makes stakeholder and public engagement in environmental management work? *Restoration Ecology*, 26, S7–S17. https://doi.org/10.1111/rec.12541

Roldán, A.M., Duit, A. and Schultz, L. (2019). Does stakeholder participation increase the legitimacy of nature reserves in local communities? Evidence from 92 Biosphere Reserves in 36 coun-

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