East African Journal of Science, Technology and Innovation, Vol. 1 (1): 2019, 51-65.

Stakeholders' inclusion and mobilization in co-management of Lake Turkana fisheries, Kenya

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Abstract

Lake Turkana, the world's largest desert lake, is the second largest producer of freshwater fishery in Kenya. The lake is co-managed by stakeholders' groups called Beach Management Units (BMUs) in a co-management arrangement with the government. Despite the enactment of co-management policy, management related challenges including illegal, unreported and unregulated fishing, overexploitation and resource use conflicts still bedevil the lake leading to plummeting fisheries production. This study identified gaps in stakeholders' inclusion and mobilization methods used by BMUs. Data was collected using questionnaires from 693 respondents in eight beaches. Chi-square was used to test for statistical associations between variables ($p \leq 0.05$). Results showed that 13 stakeholders grouped into county government (24%), national government (35%) and donors (42%) were included in the lake's fisheries management. Although stakeholders' level of inclusion was not statistically significant (x^2=4.8911, df=2, p=0.08668), they were associated with certain activities (x^2=202.72, df=8, p<0.001). Donors were engaged in training (84%) and provision of equipment (62%), national government mainly provided security (60%) while County government was associated with marketing infrastructure (56%). BMUs enhanced stakeholder's inclusion by accepting their opinions (54%), invitation to BMU meetings (26%) and allocation of roles (20%). Information was disseminated through BMU secretaries (41%), announcement in public forums (35%) and phone calls/messages (24%). Although most stakeholders were included in fisheries management, key institutional stakeholders such as National Environment Management Authority, Kenya Maritime Authority and Kenya Ports Authority were missing indicating absence of multiple stakeholders who would provide support in specific areas of co-management. Besides, current mobilization methods were inadequate since they excluded traditional leaders, publicity materials, periodic newsletters and electronic/social media platforms. This study points out critical gaps in stakeholders' inclusion and mobilization. The gaps should be filled by careful review of fisheries co-management policy at County level to allow for effective fisheries management.

Keywords: *Beach Management Units; Co-management Fisheries; Lake Turkana; Stakeholder*

Introduction

Lake Turkana is located at the north of the eastern Rift Valley at an altitude of 375 m above sea level and extends from 35°50′ to 36°40′ E and 2°27′ to 4°40′N (KMFRI/LTRP, 2007).

The lake is a designated United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site owing to its role in support to biodiversity and local livelihoods including fishery.

Cite as: *Maurice Ogoma, et al., 2019* Stakeholders' inclusion and mobilization in co-management of Lake Turkana fisheries, Kenya, *East African Journal of Science, Technology and Innovation 1(1): 51-65.*

Received: 25/06/19
Accepted: 12/09/19
Published: 25/10/19

It is the world's largest desert lake covering an area of 7560 km^2 and the deepest water mass in Kenya (Campbell *et al*., 2003).
The lake supports fishery and related livelihoods of approximately 300,000 people (ILEC, 2013) most of whom are extremely poor and have high potential for violent conflict including with tribesmen from Sudan and Ethiopia over the diminishing resources (Hathaway, 2010).

Although African lakes are facing many challenges as reported elsewhere (Tweddle *et al*., 2015), Lake Turkana particularly faces management related challenges that have resulted in its plummeting fisheries production. The challenges have resulted from illegal, unreported and unregulated (IUU) fisheries, poor fish processing and storage, resource-use conflicts among others (GoK, 2014). These challenges continue to bedevil the lake despite the implementation of co-management approach, a collaborative management paradigm that is widely promoted by the government and supported by local communities for management of fisheries and other natural resources including forests, water and wildlife.

Co-management is a governance strategy under decentralization reforms and is promoted for managing complex social-ecological systems such as small-scale fisheries (Quimby and Levine, 2018; Gutierrez *et al*., 2011). The emergence of this approach has seen many countries move from the centralized command and control system to a more participatory approach through involvement of multiple stakeholders. The approach has been promoted in Asia, Latin America and many African countries to improve natural resource governance (Wily, 2002) but has realized varied levels of success. Co-management is promoted for managing complex social-ecological systems such as small-scale fisheries (Quimby and Levine, 2018). It is a decentralized approach to resource governance that involves sharing of authority and responsibility among government and stakeholders as co-equal decision makers (Pomeroy, 2006).

According to Allison and Badjeck (2004) co-management has had different outcomes. The approach was initially marked with failure in Asia and Africa due to sabotage by powerful individuals, absence of management plans, conflicts and lack of fisheries data. Other challenges included increased illegal fishing, inappropriate legal framework and marginalization of poor people. Despite this, co-management has been a successful approach in other countries such as Bangladesh where it promoted cultural integration and led to increased access to credit by fisher-people. The approach enhanced community-government collaboration in Sri-Lanka, and supported establishment of legislative framework and enhanced enforcement of measures and rules in Nigeria. In Uganda, co-management led to stakeholder inclusion and improvement in revenue collection (Scullion, 2010) while in Tanzania, it controlled influx of migrant fishers, reduced illegal fishing and improved the hygiene of landing sites (Luomba, 2013).

In Kenya, fisheries management followed a top-down approach with limited contribution from stakeholders after independence. According to GoK (2014), this command control approach contributed to decline in fish stocks of some local fisheries, environmental degradation, fishing conflicts, and use of illegal and/or destructive fishing gears. Consequently, the Department of Fisheries developed Fisheries (Beach Management Units) Regulation of 2007 and National Oceans and Fisheries Policy (NOFP) of 2008 to adequately articulate the overall policy and legal framework of the fisheries sector. Currently, fisheries resources are governed and managed under Fisheries Management and Development Act of 2016 (GoK, 2016). The stakeholder organization representing fisheries user groups in co-management arrangements and implementation is referred to as Beach Management Unit (BMU).

In the context of small scale fisheries the success of co-management means the inclusion of many actors from local scale to national level, commonly referred to as stakeholders. Stakeholders in co-management are defined as individuals, groups or organizations of people who are interested, involved or affected either positively or negatively by resource use and management (Nga, 2015) and may be different from place to place. Fisheries co-management involves stakeholders at various levels and the sharing of responsibility varies between government and user-groups (Pomeroy, 2006). According to Nga (2015), the key stakeholders in fisheries co-management include resource

users such as fishers and fish farmers, and both central and local government. Other stakeholders include community members, consumers of fish and fish products, fishing boat owners, fisheries traders and fish processors, and change agents such as NGOs, universities and research institutions.

Stakeholder inclusion plays a crucial role in sustainable fisheries management (Msomphora, 2016) with the ultimate aim of attaining a more appropriate, more efficient, and more equitable resource management (Nga, 2015). It also ensures increased involvement of underrepresented groups, enhanced trust and ability to act on decisions, and social learning among stakeholder groups (Brumbaugh, 2017). Various mobilization strategies can enhance participation of stakeholders in co-management arrangement. These strategies include participation in decision making, trust, power sharing, social learning and development of common views towards co-management (Araujo and Seixas, 2013). The aim of this study was to assess the gaps in stakeholder inclusion and mobilization strategies used by BMUs in Lake Turkana fisheries management. The specific objectives of the study were to; (1) identify the types of stakeholders in Lake Turkana fisheries co-management, (2) assess stakeholders' inclusion levels in BMUs activities, and (3) assess the strategies used by BMUs to mobilize stakeholders.

Materials and Methods

Ethical considerations

The study was cleared by Egerton University Graduate School and permission to conduct the research was sought from Kenya National Commission for Science, Technology and Innovation (NACOSTI). Prior to the study, four interviewers were trained on interviewing skills and how to handle data collection at community level. Throughout the research, confidentiality was maintained with the collected data. All interviewees were treated with dignity while personal data were treated as anonymous.

Research design and data collection

This study adopted a cross-sectional research design whereby the BMU members were the subject of study. Eight BMUs representing 35% of all BMUs (N=23) in Turkana County were selected on the basis of having been operational for at least five years. Questionnaires with both structured and semi-structured questions were used to collect data from respondents aged 18 years and above of all genders. Systematic random sampling was used to select the respondents for questionnaire administration. Every third registered BMU member was picked as a respondent from the list of BMU members obtained from the respective BMU offices. Sample size allocated to each BMU was determined using the Cochran formula $n_0=z^2p(1-p)/e^2$ Where; n_0=Sample size, Z=Z score, p=Standard Deviation, e= Margin of error (Cochran, 1977). We assumed that at least 90% of the respondents were aware of BMUs and their operations. Hence, $n_0=3.8416*0.9(0.1)/0.0025$ = 138 sample size recommendation. Since the population of BMU membership was small, we modified the Cochran formula for each BMU following Bartlett (2001) as follows: $n=n_0/(1+n_0-1)/N$, where n_0 is Cochran's sample size recommendation, N is the population size, and n is the new, adjusted sample size. The resulting sample sizes per BMU were added giving 693 respondents.

Three weeks prior to data collection in Lake Turkana, the questionnaires were pre-tested at Lake Baringo located in Kenya's Rift Valley basin. Sample questions were selected and administered upon which Cronbach's (coefficient) alpha (α) was used to measure reliability or internal consistency of the tools (Cronchbach, 1975) using the following formula: $\alpha=N.\ \bar{c}/\ \bar{v}+(N-1).\ \bar{c}$, where: N = the number of items; $\bar{c}$ = average covariance between item-pairs; and $\bar{v}$ = average variance. The reliability of the items was based on the estimates of variability among the responses to the items. The alpha values that were equal and/or more than 0.7 were considered significant (Tavakol and Dennick, 2011). To improve the validity of the findings, secondary information and observations were also used to supplement the primary questionnaire data.

Data analysis

Data were summarized and generated as frequencies and percentages in MS Excel and presented in tables and charts. Quantitative data were subjected to chi-square test ($p<0.05$) in R Statistical software to test for statistical associations between variables su
ch as stakeholders' level of involvement in BMU activities and guidelines in place to

ensure their inclusion. Chi-square was also used to test for associations among BMUs in performing various activities such as trainings, provision of fishing equipment, marketing, security and conflicts resolution.

Results

Types of stakeholders

Thirteen stakeholders were included in co-management of Lake Turkana Fisheries. However, for ease of analysis, we grouped the stakeholders into three categories; County Government, National Government, and Donors. Stakeholders from County Government included ministry of Tourism and ministry of Agriculture, Livestock and Fisheries mainly represented by State Department of Fisheries and the Blue Economy (SDF&BE). Stakeholders from National Government included institutions directly responsible for fisheries policy formulation and enforcement such as Ministry of Environment and Forestry (MEAF), Local Administration (Chiefs) and Constituency Development Fund (CDF). Others were research-based National Government institutions such as Kenya Marine and Fisheries Research Institute (KMFRI) and Universities. Donors were mainly composed of non-governmental organisations (NGOs) responsible for mobilizing resources for BMU activities and monitoring the management responsibilities of both the government and other co-management stakeholders but are not directly involved in fisheries activities at the local scale.

Stakeholder inclusion levels

There was no evidence of association between stakeholders and their inclusion levels (x^2=4.8911, df=2, p=0.08668) although respondents' perception on inclusion levels was varied. Of the 693 respondents, 42% reported highest participation by donors followed by national government at 35% and county government at 23% (Figure 1).

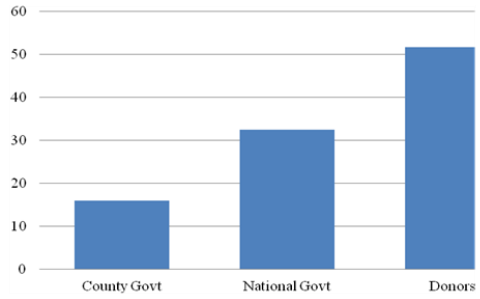

Figure 1: Respondents' opinion (%) on the inclusion levels of stakeholders on BMU activities and fisheries co-management

However, the stakeholder inclusion level was not uniform across the study BMUs. County government had highest participation in Eliye and Natirae, national government in Todonyang and Impressa while donors showed higher participation in Kerio, Lowarangak and Nariemet (Figure 2)

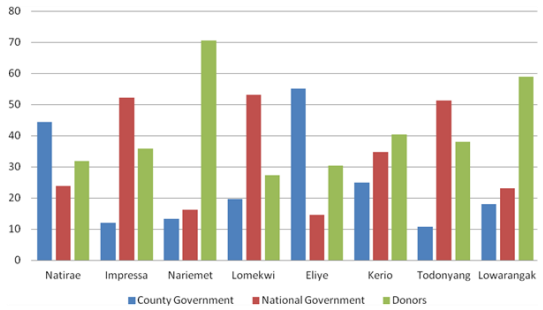

Figure 2: Proportional (%) variation in respondents' perception on stakeholders' inclusion in co-management among individual BMUs in Lake Turkana

There was variation in respondents' opinion on the level of support provided by three groups of stakeholders to BMUs and co-management (Figure 3). Stakeholders were associated with certain activities in support of BMUs (x^2=202.72, df=8, p<0.001) with training (51%) being the most common supported activity followed by provision of fishing equipment (33%), marketing (9%), security (4%) and conflict resolution (3%). Donors were mainly associated with training (84%) provision of equipment and office infrastructure (62%). County government was associated mainly with marketing (56%) and conflict resolution (55%) while the national government mainly

provided security (60%). Respondents mentioned Kenya Wildlife Service (KWS), Kenya Marine and Fisheries Research Institute (KMFRI) and Universities as stakeholders whose involvement in BMU and co-management activities are less satisfactory. Although the presence of KWS was recognised by most respondents (57%) their action on reducing fishermen-wildlife conflicts was minimal (37%) with slow response to crocodile attacks (78%) and compensation to wildlife injuries and casualties (91%). Many respondents (65%) indicated that KMFRI does not work closely with the BMUs while 83% of those interviewed indicated that the academia have not worked with them except University of Nairobi (17%).

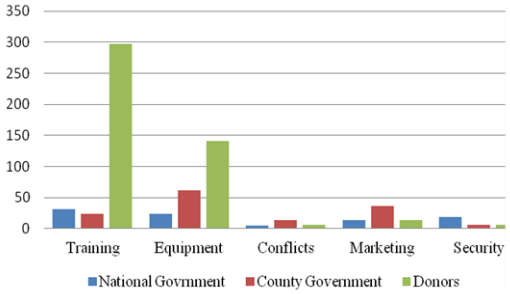

Figure 3: Respondents' opinion on the types of support provided by stakeholders to co-management and BMUs

Stakeholder mobilization strategies

The strategies used by each BMU to mobilize stakeholders were statistically significant (x^2=19.76, df=2, p<0.001). Most respondents (54%) indicated that they accepted stakeholder opinions/ideas, followed by invitation of stakeholders to BMU meetings (26%) while 20% allocated roles to stakeholders as the method to ensure stakeholders participated in their activities. There was variation in the strategies used by each BMU to ensure stakeholder participation. All study BMUs reported high scores in accepting stakeholder ideas/opinions, and low scores in allocating roles to stakeholders except Kerio and Lowarangak BMUs. Respondents also disclosed that not all stakeholders are informed of or invited to BMU meetings but it depends on the existence of an ongoing project or on the agenda to be discussed. For example, donors would be invited during the start of project activities while meetings with agendas meant to discuss financial matters were attended by many BMU members. Information was commonly disseminated to the stakeholders through BMU secretaries (41%) by writing letters to BMU members and target stakeholders. Other methods of information flow included announcement in public forums like Chiefs' *barazas*, local markets and churches (35%) and electronic media through phone calls and short message services (SMS) (24%). However, there was no association on the types of strategies used by BMUs to ensure information flow (x^2=3.8812, df=2, p=0.1436).

Discussion

Types of stakeholders

Although three broad categories of stakeholders were identified (county government, national government and donors), 13 specific stakeholders mentioned by respondents were found to belong to these categories. However, many potential stakeholders such as National Environment Management Authority (NEMA), Kenya Maritime Authority (KMA) and Kenya Ports Authority (KPA) were missing indicating a gap in stakeholder inclusion and mobilization strategies for stakeholder participation in the lake's co-management. The absence of NEMA would mean that the projects undertaken by BMUs are likely not to undergo the due process of environmental impact assessment (EIA) as stipulated in the Environmental Management and Coordination Act (EMCA) (GoK, 1999). This would have negative impact on fish habitats and fisheries livelihoods that are likely to be affected when certain projects are implemented. While KMA would ensure sea safety, their absence means that the security of fishing vessels, fishermen and welfare of passengers on transit are not adhered to hence risking the lives of seafarers who are predominantly BMU members. The absence of KPA was depicted by the absence of fishing ports and lack of fish *bandas* for handling fish at the landing sites. As a result, the fish landing sites are poorly maintained with no amenities for fish quality assurance, data collection and effective fish storage facilities negatively affecting marketing of fish and fish products from Lake Turkana.

Besides, BMU entities such as scuba diving, sport fishing, tourist vessels, tourist information centres, central fish processing stores and industrial fish processing plants were largely absent in the study areas

indicating the absence of multiple stakeholders who would promote various income generating activities to support co-management. As a result there are observed gaps due to lack of alternative livelihoods for BMU members in relation to ecotourism enterprises and part-time employment opportunities that would provide revenue to BMUs and promote economic development at households' level. Overall, multiple stakeholders would be critical for ensuring equity and sustainability (Quimby and Levine, 2018), making higher quality decisions (Reed, 2008) for fisheries co-management by incorporating more sources of information and resources. This is consistent with the findings of Vogler *et al.* (2017) who observed that it is important to include different stakeholders including the under-represented groups and 'hidden' stakeholders to help in managing resource conflicts and maintaining the democratic principles by considering stakeholder values and opinions.

Stakeholder inclusion levels

Although there was no statistical difference in perception of stakeholders' inclusion, respondents reported differences in inclusion levels of the three key stakeholder categories. Overall, donors provided fishing boats, fishing nets, training of BMU members and facilitation of fish marketing by provision of fish transport truck and storage facilities in some BMUs. The County government provided fishing boats and nets in some BMUs, conflicts resolution on boundaries disputes and marketing infrastructure through repair of roads and construction of fish markets. The national government provided security through the ministry of interior and local administration and trainings facilitated by the SDF&BE.

Stakeholders' inclusion was perceived by respondents to be important in supporting fisheries activities in Lake Turkana had there been a framework for their effective involvement in co-management. However, this was largely lacking indicating a gap in stakeholder inclusion due to lack of structured co-ordination of BMU activities. It also signifies lack of allocation of roles to various stakeholders for overall implementation of fisheries policy at the beach level. This probably couls have contributed to skewed and overlapping resource support for development of fisheries among BMUs as observed by some respondents. This argument is consistent with Araujo and Seixas (2013) who observed that effective involvement of stakeholders in coastal fisheries co-management requires clarity on the roles of each stakeholder in the process, greater transparency of rules and steps of the process and respect to diversity of values and views of individuals.

While most stakeholders may not be aware of the critical roles they could play in fisheries co-management, it is also likely that the economic value of the fisheries and related resources are yet to be disclosed to them to warrant their active involvement with the aim of defending the positions they may take in decision making for local fisheries management. This argument is supported by Cowx (2015) who observed that stakeholders, planners and politicians would be easily engaged and support their positions in management and development if information on economic valuation of fisheries resources is available, sharing of information among various players and availability of clear understanding of the intentions of a co-operative arrangement in inland fisheries management are in place.

The higher involvement of donors as perceived by the respondents could be attributed to their capacity to provide financial and material resources to support BMU activities while the national government mainly through the SDF&BE were actively involved in BMU activities since their mandate oversees formulation and implementation of fisheries laws and policies. Administratively, devolution of resources to the county level through the county government and constituency development fund (CDF) has meant that support is provided for the management of resources that are important to the livelihoods of local people, fisheries being the central resource in support of livelihoods in Turkana County.

Although we grouped the identified stakeholders as county government, national government and donors, there were overlaps in the classification due to the stakeholders' perceived level of involvement in co-management activities, and the national, county and site level mandates associated with various institutions. This observation is supported by Haambiya *et al.* (2015) who classified fisheries stakeholders of Lake

Tanganyika at local, district and national levels but emphasized that such classifications do overlap depending upon the prevailing circumstances and author perceptions.

Effective stakeholder inclusion and involvement in co-management by research and academic institutions may require translation of research findings into locally consumable results through a feedback mechanism. This would guide resources management, involvement of BMU members in data collection where possible, review of national policy on fishermen-wildlife conflicts compensation timelines, and capacity support for infrastructure, human resource and finance. Although respondents reported low participation of research and scientific stakeholders such as KMFRI, KWS and local universities, their engagement may yield positive results that can provide relevant information which the BMUs can use in fisheries management while scientists can also benefit from data collected directly by or from the BMU members. Sampedro *et al.* (2017) demonstrated that stakeholder engagement through dialogue and many interactions was beneficial for both scientists and the fishing industry by providing information that would enable managers to influence decisions that may affect them directly and also provide management strategies being imposed on stakeholders.

The results depict that training is one of the key ways in which donors support government policies by working closely with the SDF&BE to oversee the implementation of the fisheries policy (NOFP, 2008) and the Fisheries (BMU) Regulation in the Fisheries Act (GoK, 2016). Decentralization of fisheries governance could also be a factor necessitating the government to seek support from donors for training so as to build the capacity of BMU leadership and members in understanding the laws and regulations that govern co-management of resources. Although conflicts is a key challenge facing BMUs, the county government through SDF&BE and Lake Turkana BMU Network were reported to be involved in conflicts resolution. Out of these, the BMU Network only engages in resolving conflicts between two or more BMUs that are mainly boundary related. This leaves internal wrangles to be resolved by the BMUs themselves and occasionally by the SDF&BE which sometimes lack the capacity for conflicts resolution considering that some of the conflicts are armed violence in nature. It is necessary to strengthen the capacity of the BMU Network to resolve internal conflicts and oversee the lake-level implementation of policies since the network draws membership from BMU representatives at the Lake Turkana water body level.

Types of activities supported by stakeholders

The results confirmed that stakeholders are associated with certain activities indicating that stakeholders have preferences in areas of involvement where they develop specific interests. This is consistent with the results of Aanesen *et al.* (2014) who concluded that preferences of stakeholders are different due to varying priorities and interests. Most donors for example supported training activities that would contribute to knowledge sharing and acquisition of skills that are critical for management of fisheries resources. This could also be an indication of the gaps in knowledge related to sustainable fishing and management by law. Although it was not within the scope of this study to establish specific types of trainings conducted, we assumed that some of them were conducted in relation to law enforcement and use of newly acquired fishing equipment and gears.

Donors would likely be interested in training to fill in the gaps left by the County and national governments due to the huge financial resources obligations that are required to meet training objectives and the need to increase their frequencies to fully disseminate skills and knowledge. Stakeholders were also involved in provision of fishing equipment for BMUs indicating low capacity of fishermen to acquire the right equipment for improved fish production hence underutilization of fishery resources. However, the acquisition of fishing equipment should be treated with caution since it may increase fishing effort that is likely to lead to overfishing further impacting on the already plummeting fishery resources.

Market infrastructure was provided mainly by the County and national governments signifying that markets are critical in the fishery value chain. As a result, market structures such as fish bandas, fish stalls, fish storage and processing facilities should be provided as market infrastructure by stakeholders. These should be made available at fish landing

beaches, local and county markets by the County government with support from the national government and donors. Although security is a critical function of the national government the results indicated that other stakeholders also contribute to local security in remote and hardship areas like Turkana. These include voluntary surveillance, provision of intelligence information to security personnel while some donors provide off-road vehicles for personnel working in violence-prone areas of northern Lake Turkana. Conflicts resolution received little attention from stakeholders indicating that some stakeholders who should undertake such responsibilities are not active in co-management mandate. For example, the inactivity of KWS has led to increasing crocodile-wildlife conflicts in the central and northern Lake Turkana while compensation for wildlife attacks and casualties are wanting. The BMU Network that should resolve conflicts related to BMU areas of jurisdiction and inter-BMU conflicts are also incapacitated due to inadequate resources including unclear resource acquisition structures including finances and lack of office infrastructure making coordination of their work difficult.

Stakeholder mobilisation strategies

A majority of respondents (54%) indicated that BMUs accept stakeholder opinions/ideas as a strategy for stakeholder participation indicating that some stakeholders could easily push through their own agendas, mainly through BMU officials, but this could not be of total acceptance by the wider BMU membership. Another mobilisation strategy is invitation of stakeholders to BMU meetings indicating that BMUs recognise the central role played by various stakeholders in their activities. The stakeholders attend meetings as observers and to provide guidance on critical agenda mainly during elections and discussion of donor budgets indicating that the stakeholders attend such meetings only when their interests are meant to be discussed. Ideally, they attend meetings not to entirely influence the decisions made by BMUs but to provide guidance on topical agenda that are important to their organisations. For example, the respondents reported that SDF&BE attended meetings during elections of BMU officials since it is a legal requirement for BMUs to conduct elections every four years or to introduce development partners mainly donors. However, donor agencies occasionally attended BMU meetings to guide them on the use of financial resources, proposal development and reporting guidelines since they fund the implementation of various BMU projects and activities.

Three most common means for information dissemination within the BMUs and with the stakeholders included communication through the BMU secretaries, announcements through public forums and use phone calls and short message service (SMS). However, these strategies are not sufficient indicating a lack of diversity in the methods used to ensure information flow. Communication by letters through BMU secretaries who are given the legal mandate through the BMU regulations as custodians of records and official communication within the BMU and with external agents was the most common. However, the use of letters could be costly in terms of time taken for dissemination to target audience and the need for additional resources such as stationeries and postage for their preparation and dissemination respectively. There could also be the risk of misinterpretation in case the language used is English or Kiswahili due to low literacy levels of some BMU members.

The BMUs used two other methods of dissemination including public forums and phone calls/SMS as subsidiary to letters. There could be a challenge with public forums since BMU officials may not have control over who attends such gatherings and the likelihood of impromptu nature of when such meetings are held. Poor telecommunication network in some localities around Lake Turkana and inadequate ownership of mobile handsets could also interfere with communication and information flow. The BMUs only restricted themselves to the above three methods indicating lack of diversity in the methods used for information dissemination signifying a gap on communication methods with stakeholders. As a result, stakeholders may not participate in certain activities due to poor access to information further challenging fisheries co-management.

Despite the above information dissemination challenges, there are many communication strategies that could be explored for Lake Turkana fisheries. The use of traditional leaders who hold authority within local communities

could be utilized following Murshed-e-Jahan *et al.* (2014) who suggested the use of informal institutions and development of participatory communications framework for coastal fisheries management. Other sources that are not in use currently include publicity materials such as brochures and periodic newsletters, which would also act as advertisement platforms for both BMUs and stakeholders. With the increasing coverage of telecommunications network in northern Kenya, Turkana inclusive, the use of social media platforms such as Whatsapp, Facebook and Instagram among others could be explored for easier communication among stakeholders and between BMU members. The use of this diversity of communication sources is consistent with the findings of Haambiya *et al.* (2015) who recommended the establishment of stakeholder clinics with adequate communication strategy for information dissemination among stakeholder groups in order to strengthen their relationships and increase their perceived presence in the fishing communities.

Conclusion and recommendations

Most potential stakeholders who are critical for advancement of co-management were missing while there was passive participation of present stakeholders largely as a result of gaps related to their inclusion levels and mobilization. The gaps included lack of collective action and structured co-ordination of stakeholders to support co-management and BMU activities, lack of clarity on stakeholder roles in co-management process and lack of diversity of information dissemination methods between BMUs and their stakeholders. This has led to inadequate support for fisheries governance and poor attention to major roles that stakeholders would collectively play including conflicts resolution, development of fishery management plans, monitoring of fisheries and environmental resources.

This study recommends establishment of stakeholder networks at the lakewide level to work in tandem with the lake's BMU Network. The stakeholder network will provide a platform for information sharing, organising fisheries learning exchange visits and exhibitions for sharing of best practices and enhancement of relationships among stakeholders. Owing to the potential role of stakeholders in fisheries co-management, there is need to review fisheries co-management policy and support county governments to legislate fisheries decentralization policies. The revised policy should provide clear roles of stakeholder groups, support fisheries extension education and promote BMU capacity development. Besides, citizen science involving BMU members in data collection should be explored for data acquisition and monitoring while incorporating the views of the local fisherfolk into mainstream science by the academia and research institutions.

Acknowledgements

Egerton University provided the resources for undertaking this project including two members of staff for project supervision. The SDF&BE, KMFRI and Turkana County governmant provided technical advise on site access and gave initial critical information about the Lake's BMUs for logistics arrangements. We are grateful to BMU officials and members who provided information as respondents. National Council for Science, Technology and Innovation (NACOSTI) provided research permit to conduct the research.

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