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Original Article

Community Water Governance In Lower Thiba Sub-Catchment, Kenya

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ABSTRACT

Effective water governance ought to involve the manner in which allocative and regulatory politics are exercised in the management of water resource, and should embrace the formal and informal institutions by which authority is exercised. In Lower Thiba Sub-catchment of Kenya, slightly over 70% of the population in the area depend on water for irrigation purposes. This study explored how the existing legal instruments and institutions affect water governance in the area. Data was collected from 361 respondents using questionnaires, 9 key informant interviews, 5 focus group discussions, as well as direct observations. The data were analyzed through descriptive statistics using Statistical Package for Social Science (SPSS) Software. The results showed that 87% ($P \leq 0.05$) of the respondents were aware that they need to protect water resources, though only 50% reported a supportive attitude. This can be explained by the fact that river water is accessible throughout the year to most farmers, hence the need to conserve water is not urgent. 76% of the respondents were aware of existing water sector government institutions and rules in existence. Awareness of the water sector laws was at 68% while compliance to the same was at 80% ($P \leq 0.05$). Low awareness level of the public at 65% and weak enforcement from the regulators (20%) were cited as major reasons for non- compliance to the existing water rules. Main enforcement agencies were the water committees at 50% ($P \leq 0.05$), formed from water users associations in the area. In all, 56% of the respondents felt that the existing legal and institutional frameworks governing water were effective. Only 51% were members of community water institutions, with WRUA having the highest membership of 44% across the sub-catchment. Based on the findings, the study concluded that there is need for strengthening community involvement in water governance, enhancing capacity building to the surrounding community, and enforcement of water conservation and management laws within the sub-catchment.

1. Introduction

The problems of access to adequate water for domestic, industrial or agricultural production have now been widely considered problems of governance and not just the natural resource endowments, or the lack of financing and appropriate technology. The UN has consistently observed that the scarcity at the heart of the global water crisis is rooted in power, poverty and inequality, not in physical availability (UNDP, 2006). Water governance relates to the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services at different levels of society (Muigua, 2017; Rogers & Hall, 2003). It is the set of systems that control decision-making with regard to water resource development and management (Moench et al., 2003). Good water governance is based on principles of good governance, which include equity, efficiency, participation, decentralization, integration, transparency and accountability (Hohenthal, 2018). Yet there is also a tendency in the water sector to reduce issues to their component parts and thereby lose sight of the overall governance picture. In Kenya, water resources management is governed by a myriad of laws and institutions within the sector (Government of Kenya, 2002).

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In this structure of regulatory framework everyone has a right to clean safe water in adequate quantities and support community water associations that help with water management and conservation in local areas. The Kenyan constitution (2010) introduced devolved units, which have necessitated the review of the Water Act. County governments are now vested with the function of water services provision in close collaboration with the national water services regulation board. At the community level, the Water Act provides for the water users association formation to ensure water resource conservation and resolve resource conflicts at the community level. Effective water governance ought to involve the manner in which allocative and regulatory politics are exercised in the management of water and other natural resources, and should embrace the formal and informal institutions by which authority is exercised. Recognizing water as a commercial input with conflicting users with their experience and integrating them in a participatory way in institutions is key to effective water governance (Kanyua, 2020).

In Lower Thiba sub-catchment, there is frequent politicization of the water resource, especially during the dry season when water availability is low. Community water institutions such as WRUAs help in resolving water based conflicts and ensuring access to water for the most basic needs, during the dry seasons (LTSCMP, 2012). However, despite the significance of these local water institutions to water management, there are a few or no government policies linking them to these institutions (Mutschinski and Cole, 2021). Appropriate water resources management policy and planning can ensure that right institutional, economic and regulatory instruments are established for the management of watersheds and water quality, efficient yet equitable water allocations between uses and sound investments in water conservation and storage (Ogendi and Ong'oa, 2009). In Lower Thiba sub-catchment, water governance is coupled with difficulties such as unsustainable water use practices, numerous and overlapping laws, disjointed water sector management and lack of meaningful involvement of the community in water management and policy development. As correctly observed by previous study, good water governance policy has to consider and make provision for effective collaboration and coordination across multi-level actors and stakeholders (Njagi et al., 2021; Oremo, 2020). This study therefore seeks to examine the existing community water governance laws and institutions, the compliance levels and how they affect water resource use in the area.

2. Conceptual framework

Water governance in Kenya is regulated under the Water Act 2002 (amended 2016), which gives the community power to participate in governance of water locally through community water institutions. These community water institutions include; Irrigation Water Users Associations (IWUAs) and Water Resource Users Associations (WRUAs), and use sub-catchment management plans to ensure effectiveness. In Lower Thiba Sub-Catchment, there is one WRUA (RWATHIBA WRUA) that works in collaboration with WARMA to ensure water resource conservation at the sub-catchment. The sub-catchment also consists of Mwea Irrigation Scheme (MIS) that is managed by the National Irrigation Board (NIB) and IWUAs at the local level. The National Government as well as the County Government both have a role in water governance in the sub-catchment. Water service providers as well as Non-governmental organizations operating within the area, such as faith-based organizations are also involved in water resource governance. Across the sectors related institutions such as environment, land, forestry, irrigation and agriculture departments are also involved in regard to water resource use in the sub-catchment. All these institutions with the related policies ought to work in collaboration with each other and with the community to ensure effective water governance (Fig. 1).

Compliance to these laws is determined by various factors, among them awareness and enforcement of these laws.

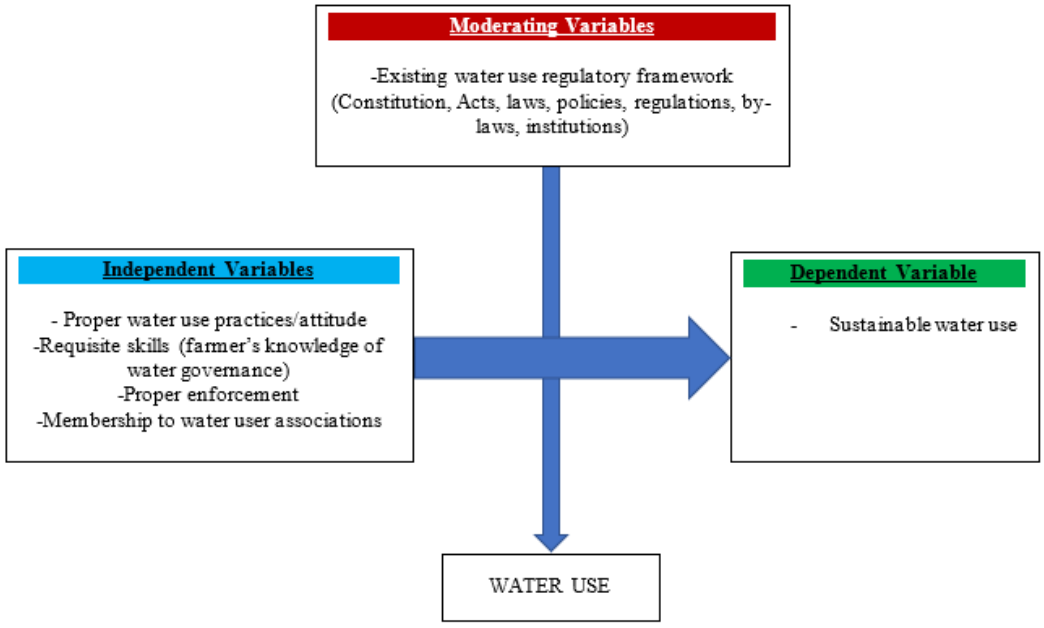

Fig. 1. Interaction between water governance factors

This study used the institutional theory which posits that the social context in which institutions operate influences the behavior in and of that community (Hillebrand et al., 2011). The theory was used to test whether the water-based institutions in Lower Thiba sub-catchment have established processes and test the community knowledge, attitudes and practices and how they interact with the existing regulatory frameworks to achieve or fail to achieve sustainable institutionalized behavior for effective water resource management in the area.

3. Methodology

The study was conducted at Lower Thiba Sub-catchment located in Kirinyaga County, Kenya (Fig. 2), and occupies Mwea east and Mwea west sub-counties which are located on latitude 37°37'E and 0°50'S. It occupies the lower altitude zone of Kirinyaga County, in an expansive low-lying savannah ecosystem. The area receives a mean annual rainfall of 400mm per year or less, with maximum rainfall occurring in April/May and October/November. The average temperatures range from 12.5°C to 27.5°C (Njeru et al., 2015). The soils are vertisols characterized by dark colour with a mixture of loam. The red soils found in the higher areas of the settlement consist of red lateric clay, and are used for subsistence crops and horticulture production. Majority of the people live in the rural areas engage in rice growing at Mwea Irrigation Scheme and the surrounding areas (Indeche and Mwaura, 2015). However, the increase in population has resulted in establishment of settlements in areas that were exclusively used for farming. Water from rivers Thiba, Nyamindi, Murubara and the canals that draw water from these rivers are the main water sources. Apart from providing water for irrigation purposes, water from the rivers is used for domestic purposes (Kasuni, 2017). Another source of water is boreholes which have been sunk in several areas. The main industry is irrigated agriculture which includes paddy rice production as well as horticulture farming. Paddy rice is mainly done in the middle zone of the sub-catchment at MIS while horticulture is common in the upper and lower zones of the sub-catchment where mainly French beans, tomatoes, onions, water melons and passion fruits are grown (Mburu, 2013).

Data was collected in the year 2018 using a detailed questionnaire, key informant interviews, focus group discussions, direct observation and review of secondary literature. A total of 375 community respondents were interviewed (n = 375); consisting 361 questionnaires, 5 focus group discussions and 9 key informant interviews. Sample size determination was based on Yamane (1967), with a total 33,875 households using an average household size of 6 (KNBS, 2009); (Data was collected in year 2018).

$$n = N/1 + N\,(e)^2$$

Where n is the sample size, N is the population size, and e is the level of precision (0.05), A 95% confidence level and P (variability level) = 0.05. The sub-catchment was divided into 3 sections for purposes of sampling; upper, mid, and lower zones comprising (Kutus/Kimbimbi area, Ngurubani/Karira area and Ndindiruku/Makima area respectively). The targeted community members were within these three zones and those surrounding the sub-catchment up to a 5km radius. The questionnaire targeted household heads or the senior most person in the homestead who had attained the age of 18 years or more, which is considered as age of consent in Kenya. Questionnaire pretesting was done to a small sample before the main data collection commenced. This helped refine the tool to ensure that questions were structured in a way that did not influence the responses. The pre-test data was also used to evaluate the questionnaire administration and get familiar with the instrument, as well as the area.

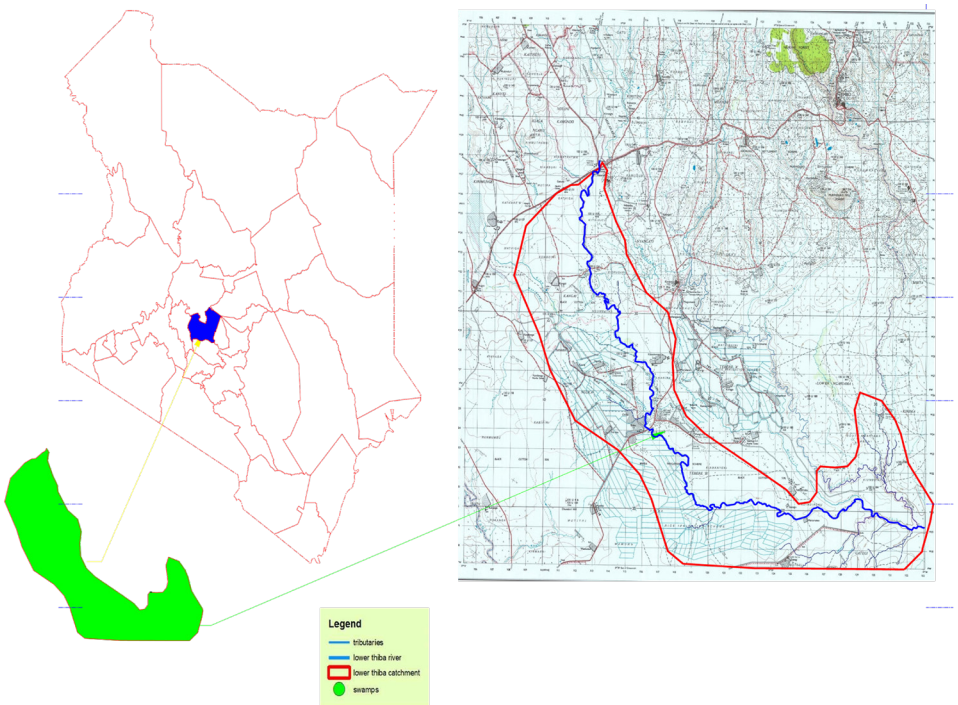

Fig. 2. Lower Thiba Sub-catchment map

Random samplind was done where data were collected by drawing line transects, where every fifth household along the transect line was considered for interviewing. Transect walks were done throughout the sub catchment area upon which observable records were also captured. Key officials from relevant sectors were purposively sampled and interviewed both from the national and county governments (WRMA, Agriculture / Irrigation, KIRIWASCO (main water service provider in the county), NEMA, KFS and NIB). Focus Group Discussions (FGDs) comprising members of the community, members of WRUA, IWUAs and NGOs separated into male and female groups, were also conducted. Information from focus group discussions and key informant interviews was used to corroborate the information provided in the questionnaires. Relevant published literature from various sources were also perused. The data was analyzed using Statistical Package for Social Science (SPSS) software and presented with descriptive statistical tools that include; percentages, means, standard deviation, frequency distribution tables, cross tabulation, and chi-square test, graphs, and pie charts.

4. Results

4.1 Existing Legal Instruments that Regulate Water Use in Kenya

Table 1. A list of ratified conventions and existing legal instruments and what each of them regulate in relation to water use in Kenya.

Legal Instrument	What is regulated	Action Point
United Nations Agenda 21 Blue Print	Water catchment degradation and development of fresh water resources through holistic management of natural resources	Ratified in Kenya (14th June 1992)
African Convention on Conservation of Nature and Natural Resources, 2003	Conservation and sustainable utilization of water resources; integrated management of water resources and conservation of water catchment areas	Ratified in Kenya (11th July 2003)
East African Community Treaty Chapter 19	Environmental degradation; urges environmental management, conservation of water resources, sustainable utilization of natural resources and protection of critical ecosystems.	Ratified in Kenya (7th July 2000)
The Constitution of Kenya 2010. Chapter 4: Article 43:1(d)	Right to clean and safe water access in adequate quantities	Parliament, Ministry of water, county governments.
The Constitution of Kenya 2010. Chapter 5: Article 69:1(a)	Sustainable exploitation, utilisation, management and conservation of natural resources and equitable sharing of benefits arising from such resources	Ministry of Environment and Natural Resources, National Environmental and Management Authority (NEMA), County governments
The Constitution of Kenya 2010. Chapter 5: Article 69:1(b)	Public private partnerships in management, protection and conservation of natural resources	Relevant sector ministries and departments, county governments
The Constitution of Kenya 2010. Chapter 5: Article 69:2	Citizenry duty and responsibility to protect and conserve the environment, as well as ensure sustainable development and use of natural resources	Relevant sector ministries and departments, county governments
Kenya Vision 2030 blueprint (2002). Social Pillar: Water and Sanitation sector	Ensure access to safe, clean water and sanitation for all; conserve water sources and harness alternative water sources such as rain water and underground water; and increase acreage under irrigation	Relevant sector ministries and departments, county governments
Kenya Vision 2030 blueprint (2002). Social Pillar: The Environment	Ensure clean, secure and sustainable environment through; pollution and waste management, environmental conservation, public-private-partnership in the water sector, harmonize all environment related laws for better governance	Parliament, related sector ministries and departments, county governments
The Water Act, 2016	Provides for regulation, management and development of water resources; as well as provision of water and sewerage services	Relevant Sector ministries and departments, county governments, CBOs and NGOs.
National Irrigation Act, 2019	Provide for the development, management and regulation of irrigation sector in Kenya	National Irrigation Authority, County Irrigation departments
National Lands Act, 2012	Provides for sustainable administration and management of land and land-based resources	Ministry of lands, National lands commission, other relevant departments, county governments
EMCA, 1999	Provides for establishment of appropriate legal and institutional frameworks for the management of environment and natural resources	NEMA
Agriculture Act, 2012	Promote and maintain a stable agriculture, provide for conservation of soil fertility and stimulate development of agricultural land	Ministry of Agriculture, livestock and fisheries, relevant departments and county governments
National Forests Conservation Act, 2016	Provide for the development and sustainable management, including conservation and rational utilization of all forest resources	Ministry of Environment and Natural Resources conservation, relevant departments

4.2 Water sector Regulators in Kenya

Table 2 contains the list of the water sector institutions and regulators in Kenya as established under the Water Act (2016). The role of each institution and means of enforcement of each regulation is indicated.

Regulator	Means of Enforcement / Regulation
Ministry of water and irrigation services (State department of water)	National water policy formulation and coordination
Water Sector Regulatory Board (WASREB)	Regulate water use services by means of issuing permits, approvals to water service provision boards
Water works development agency (WWDA)	Water sector assets development
Water Resources Management Authority (WRMA)	Formulate and enforce standards for management and use of water, regulate water resources by licensing basin committees, issuing permits for inter-basin water transfers, determine /set and collect permits fee and water use charges, ensure coordination with relevant arms and monitor compliance with the permits.
Basin Water Resources Committees (BWRCs)	Management and development of water resources through issuance of water use permits, water apportionment, water protection, flood mitigation
Water Sector Trust Fund (WSTF)	Provides a pro-poor basket fund within the water sector through; provision of conditional and unconditional grants to counties, equalisation fund to fund water development and management initiatives in marginalised areas
National Water Harvesting and Storage Authority (NWH&SA)	Maintain national public water works infrastructure, develop and enforce water harvesting policy, undertake emergency interventions during drought
Kenya Water Institute (KEWI)	Training and research within the water sector
Water Service Providers (WSPs)	Provision of water services within their area, and develop county assets for water provision
Water Tribunal	Hear and determine cases under the water sector

4.3 Legal Obligations for various Water Governance Institutions in Kenya

Table 3. A summarized list of government water-based institutions as well as community water-based institutions and their legal instruments used for governance.

Government (National/County)	Legal Instrument(s) used	Community based water organizations/ associations	Legal instrument(s) used
Water Resources Management Authority (WRMA)	National Water Regulations	Water Resource Users Associations (WRUAs)	Sub-Catchment Management Plans
Basin Water Resource Committees (BWRCs)	Basin Area Water Resource Management Strategies	Water Resource Users Associations (WRUAs)	Sub-Catchment Management Plans
Water Works Development Authority	Water Works Agreements	Not available	Not available
Water Sector Regulatory Board (WASREB)	National Water Services Strategy / Water Services Regulations	Water Service Providers (WSPs)	Articles of Association / Memorandum of Association
Ministry of Water	National Water Resource Policy / Water Act, 2016	County Water Department	Water Act, 2016 and Water regulations
Department of Irrigation	Irrigation Act, 2019 /	-County Irrigation Development Units	County Irrigation Strategies
National Irrigation Authority (NIA) – formerly National Irrigation Board (NIB)	National Irrigation Act, 2019 / National Irrigation Services Strategy	-Irrigation Water Users Associations (IWUAs) -Scheme Management Committees -Dispute Resolution Committees	Irrigation Water Users Association Rules and Regulations -Committee by-laws and procedures
Water Sector Trust Fund (WSTF)	Water Trust Fund Regulations	Not available	Not Available
National Water Harvesting & Storage Authority	National Water Harvesting Policies and Strategies	Not available	Not Available

4.4 Knowledge of respondents on water use and governance

Respondents' knowledge on water governance was at 61% and 69% were aware of the laid down water rules and regulations in the area, (Fig. 3). Another 56% felt that existing legal mechanisms were effective. The key informants confirmed that the laid down rules were adequate but awareness to the public needs to be enhanced and enforcement mechanisms improved in the area. The most common water regulations and rules that the respondents mentioned were those imposed by the WRUA and IWUA committees. Rules from the national and county governments were rarely mentioned.

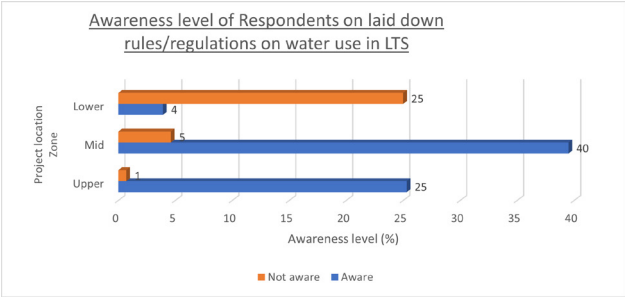

Fig. 3. Community awareness levels of water rules/regulations across the sub-catchment.

A majority of the respondents (76%) were aware of an existing government institution dealing with water issues (Fig. 4). However, the government water-related agencies that were well known to the respondents included; NIB, WRMA, NEMA, KIRIWASCO and County Water Offices. Departments within the water ministry such as WSTF, NWHSA, WASREB, and others, were not mentioned at all and the respondents were not aware of their existence nor their purpose.

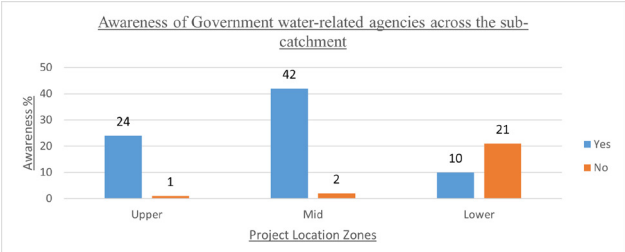

Fig. 4. Community awareness of government water related agencies within the sub-catchment (Yes = aware, No = Not aware)

4.5 Institutional support and member association organizations on water governance

In regard to the community's attitude towards proper water use, 50% of the respondents felt it was supportive and 50% felt it was not supportive. Membership to community water associations was at 58% (Fig. 5), out of which only 10% came from the lower zone of the sub-catchment.

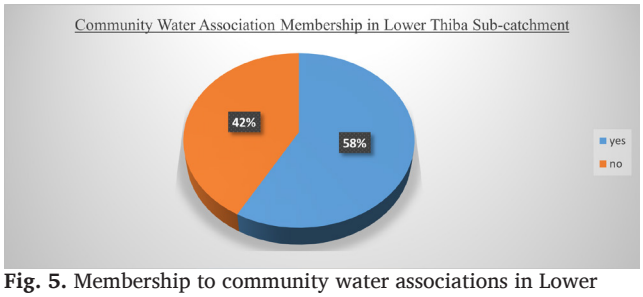

Fig. 5. Membership to community water associations in Lower Thiba Sub-catchment (Yes = members, No = Not members)

4.6 Compliance levels, Factors Enhancing Compliance to Water Laws and Enforcement agencies in LTS

Majority of respondents (80%) felt the existing water laws were being complied with (Fig. 6).

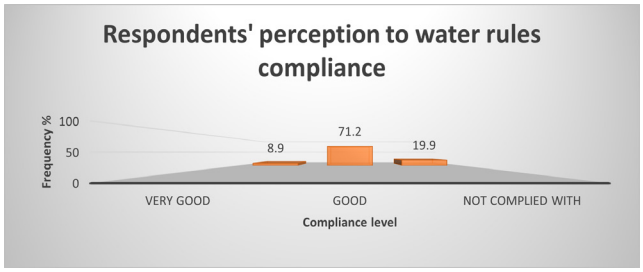

Fig. 6. Community perception on existing water rules compliance level

The 20% who felt water laws were not being complied with cited lack of public awareness at 65% as the main factor affecting such compliance. Corruption and weak enforcement by the relevant agencies was cited by 20%, while 10% felt its due to lack of institutional/government support (Fig. 7). Response from key informants also showed that water sector rules were complied with where the public was aware of them, though some members of the public (0.6%) failed to comply with some of the rules when they felt it offers no tangible benefit to comply. Sensitization to the public on the water laws and strong enforcement were cited as key to ensure compliance.

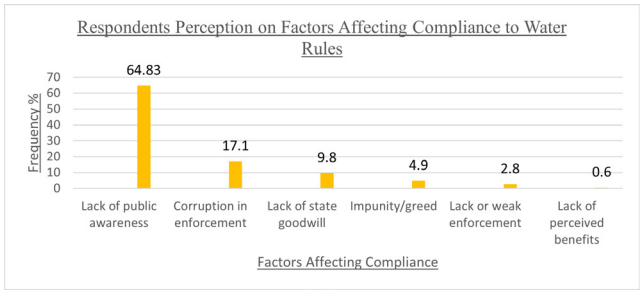

Fig. 7. Community perception on factors affecting compliance to water instruments

Most of the respondents (51.9%) cited acess to water as the major benefit to complying with water rules in the area (Fig. 8).

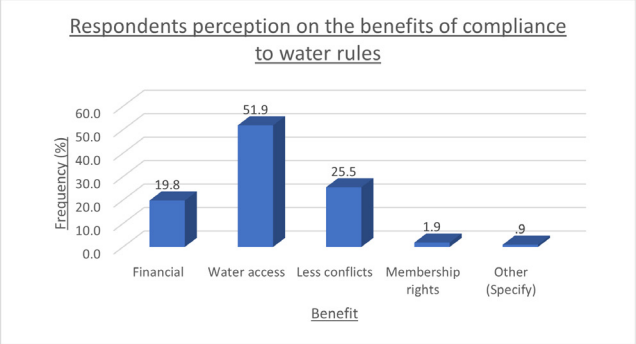

Fig. 8. Most commonly cited benefits to compliance with water rules across Lower Thiba Sub-catchment

5. Discussion

The legal and institutional frameworks cited include Water Resources Management Authority (WRMA) which works well with the Water Resource Users Association (WRUA). In addition, the National Irrigation Board (NIB) was also cited, which works in collaboration with the Irrigation Water Users Association (IWUA), especially within the Mwea Irrigation Scheme. Water Service Providers (WSP) such as KIRIWASCO were also found to be in close collaboration with community water projects. However, there were national water institutions which are not known locally, that is, NWHSA, WSTF, KEWI, Water Tribunal and WWDA. The roles and mandates of these institutions were also not clear, hence necessitating their elaboration even at national level, as observed by (Korir, 2020). It was also not clear the role of county government water institutions and a sense of duplication of roles and in-fighting between national and county water institutions. Domestication of all water policies to the sub-catchment levels is necessary inorder to respond to rooted specific water matters (Kumunga et al., 2020). The many water sector institutions could work vertically in a coordinated manner and ensure decentralization to ensure compliance; for example, respondents cited conflicts among water-sector institutions (NIB and WRMA) as they give conflicting directives to the community. The institutions also need to coordinate horizontally with other related institutions such as environment, land, health, energy, among others to minimize conflicts in the water resource management and use. The respondents in this study also cited horizontal conflicts between various institutions, with the most cited conflict being between NIB as the major water abstractor, and downstream water users during the dry season due to water shortage and pollution. Conflicts among government institutions was also cited, especially between the ministry of lands and WRMA due to allocation of public water areas to individuals, hence making enforcement difficult. Lack of clear provisions of how an institution will collaborate and coordinate with another inorder to achieve a common objective breeds conflicts in the execution of mandates (Korir, 2020).

Politicians will also interfere during the dry seasons, as the season coincides with the political campaigns nationally. This usually causes clashes between upstream and downstream water users. This agrees with the observation of a study done earlier where the researcher established that apart from fragmented nature of water laws, conflicting government institution views, political influence especially within the election cycles can compromise effective water resource management at the community level (Lee, 2018). The members of the public need to be informed on each of these institutions mandate in-order to comply with the rules therein.WRUAs need to collaborate both horizontally as well as vertically. It was observed that WRUAs only collaborate with WRMA as they are established under it, and they are not in good working terms with other agencies such as NIB. IWUAs on the other hand, were only recognized and worked with NIB, and were localized within Mwea Irrigation Scheme (Middle zone of the sub-catchment). Horizontal collaboration by local water associations is key as they handle water resource conservation issues from different aspects, including; soil water management, conflict management, and riparian boundary conservation, among other issues. Studies have shown that WRUAs have been ineffective partially because of poor collaborative governance structure (Kumunga et al., 2020).

The results showed that 61% of the respondents were aware what water governance was all about, 76% were aware of a government water related institution while 69% were aware of laid down water rules in the area. The high awareness level of water governance rules in the area is however contrary to findings of a study done in Kenya which indicated that there was low awareness of water management law in rural areas (Lee, 2018). The high community awareness on water governance could be attributed to the presence of water user associations such as WRUA and IWUA in the sub-catchment. This is in agreement with previous studies which observed that the presence of water user associations such as WRUAs and IWUAs, increased the level of community awareness on water resource governance and management (McCord et al., 2016; Oremo et al., 2019; Richards and Syallow, 2018; Kumunga et al., 2020).

Membership to community water institution across the sub-catchment was at 58%, with 57% being from the upper zone and only 3% from the lower zone. There were three main community water agencies in the area; Water Resources User Association (WRUA), Irrigation Water Users Association (IWUA), Water Service Providers (WSPs) also known at local level as ‘water projects”, and membership to the same across the sub-catchment was high (62%) in the middle zone of the sub-catchment and very low (3%) membership in the lower zone. These water committees are derivatives of either WRMA or NIB which delegates their authority to them. Membership to community water institutions helps members’ access key information and extension services in relation to water resource use and conservation. Earlier studies also established that membership to community water user associations allowed members’ easy access to information and extension advice on water use and conservation, as opposed to those who were not members of these associations (Krell et al., 2020; Kanyua, 2020). Low membership to water use institutions at the lower zone indicates lack of perceived benefits in joining these institutions due

to water shortage and pollution that ends downstream from upstream water users. These results are contrary to a previous study which concluded that it was harder to convince upstream water users to join water associations since they never experienced water shortages nor pollution, compared to downstream water users (Munyua and Mbugua, 2019). Support from the government to the community water association is key to improve their effectiveness, the study established that 50% of the respondents felt these institutions were effective. These findings are expected, given that water is a key resource to the economy within the sub-catchment. Households would join community water associations mostly because of the benefit of unlimited water access. Studies have previously shown that WRUAs provide a good opportunity for involvement of relevant stakeholders and beneficiaries in corporate management and conservation of water resources (Koigi, 2017; Simms et al., 2016).

A majority of respondents (80%) felt that there was proper compliance to existing water rules; this could be as a result of the presence of robust water use associations in the area who help sensitize the public and resolve water use conflicts. However, the 20% who felt water laws were not being complied with cited lack of public awareness at 65% as the main factor affecting such compliance. This agrees with earlier findings that indicated knowledge and understanding of responsibilities by key actors was key to compliance and involvement (Wehn et al, 2018; Ndeti, 2013). Corruption and weak enforcement by the relevant agencies was cited at (20%), while 10% felt its due to lack of institutional / government support. This can be attributed to the lack of capacity by the government institutions to enforce compliance (which can result to corruption), as well as lack of proper coordination among the institutions in-order to enforce compliance. Lack of coordination and collaboration among the water sector and related institutions, inadequate funding and overlapping or unclear roles between sector institutions can lead to weak enforcement leading to inefficient and ineffective water resource management and water service delivery (Korir, 2020). In addition, Jorgensen et al., (2009) found out that people were less likely to comply with resource governance rules if they don't trust the authority to be fair to everyone. Corruption makes those who have the financial means access more water than those who are not endowed, thereby increasing the unfair water distribution. Functional enforcement is necessary to enforce compliance in the water sector as it deters future offenders (Zaelke et al., 2005); and this is lacking in the water sector in this sub-catchment.

Water rules enforcement agencies that were perceived as most effective on the ground were water committees at 49.5%, which underpins the importance of community water institutions in water governance. However, it was noted that 29.4% of the respondents were not aware of any water rules enforcement agency, out of which 78% were from the lower zone of the sub-catchment. Respondents from this zone also cited lack of perceived benefits for compliance to water rules. This was expected as water shortage and poor quality water was the order in this zone. Deliberate effort needs to be put to ensure the lower zone of this sub-catchment is meaningfully involved in water resource conservation, use and management, as this study has shown the area is lagging behind.

Respondents also cited various benefits associated with complying with water laws, acess to unlimited source of water ranking the highest at 52%. This agrees with earler findings that adherence to rules and regulations was a good strategy in enhancing water access management and that communities would only agree to be involved in resource management if there were perceived benefits (Lesrima et al., 2021; Wehn et al., 2018). Weak enforcement to water laws was the key constraint to compliance in the area, until the dry season persists and conflicts are inevitable. The key informants called this "management by crisis' where the community members and the water sector stakeholders operate 'business as usual' until there is drought and water demand outstrips supply. At this point, the WRUA chairperson observed that 'command and control' measures do not work; and mediation and community sensitization could be more effective. At such a time, which the WRUA committee observed happens at least twice a year, NIB which abstracts 90% of the River Thiba water (MEWNR, 2014), will sell the little available resource to the highest bidder. There is need for awareness creation to both upstream and downstream water users on the finite nature of water as a resource and the need to use it sustainably and conserve it. This will also help the community see the need to join water user associations and be involved in water conservation activities (Mathenge et al., 2014).

These findings indicate the need for more capacity building to the community as well as need for strong institutions to regulate and enforce compliance with water rules.

Conclusion

This study establishes that there was considerable knowledge and community support to proper water use and management in the area but much remains to be done to include all water users, especially in the lower zone which seem to have been left behind. The study also noted that there lacks proper coordination and collaboration (vertical as well as horizontal) between water related institutions, resulting to ineffective impelementation of water laws and weak enforcement. Proper coordination and collaboration policy is key between these institutions, and should be done in a poly-centric manner to ensure effectiveness. Community participation is key to good water governance and this should be clearly stated in the existing water rules. The current Water Act, 2002 (amended 2016) as it is does not explicitly stipulate the role of community in water provision, use and conservation; leaving water resource ownership and management firmly under the grip of the national government. This results to lack of ownership to water conservation and management activities at the sub-catchment level. In addition, community awareness was cited as one of the factors that can enhance compliance to water sector rules and ownership of water resource management and conservation in the area. Further, water user institutions had contributed

greatly to improved awareness on water resource conservation, use and management in the area. These should be supported and strengthened by both levels of government inorder to ensure their continued effectiveness.

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Compliance with ethical standards

The research was carried out under Department of Earth and Climate Sciences, of the University of Nairobi. Consent of participants in interviews and questionnaire survey was sought before each individual participant. Permission was sought and granted by National Commission for Science, Technology and Innovation (NACOSTI) Ref: No. NACOSTI/P/18/38666/24273.

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