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Governance principles for local level groundwater management in Njombe District, Tanzania

Gudaga, J. L.[1], Kabote S. J.[2]* and Malisa, E. T.[2]

[1]Department of Policy, Planning and Management, Sokoine University of Agriculture, P. O. Box 3035, Morogoro, Tanzania
[2]Department of Development Studies, Sokoine University of Agriculture, P. O. Box 3024, Morogoro, Tanzania.

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Groundwater governance is a necessary condition for groundwater management that in turn improves access to clean and safe drinking water. However, it is one of the developmental issues, which has not been addressed squarely in Tanzania. Using governance principles, we explored groundwater governance in Njombe district where water for domestic use depends on groundwater source. The study used cross-sectional research design by adopting a mixed method approach with a random sample of 250 respondents. It also involved 32 Focus Group Discussion (FGDs) participants and 9 governance actors at a district and community levels. The Statistical Package for Social Sciences (SPSS) was used to summarize descriptive statistics while qualitative data were subjected to the content analysis. The results show that five out of eight governance principles namely: accountability, transparency, collaboration, rule of law and responsiveness were not practised effectively because of poor knowledge among the governance actors. To that effect, the practice of governance principles was poor translating into poor groundwater management. Therefore, district authorities should build capacity on good governance to all groundwater governance actors recognized by the law. This helps practise governance principles effectively for groundwater management.

Key words: Groundwater governance, actors, Njombe District, Tanzania.

INTRODUCTION

The information at a global level show that access to basic drinking water services is increasing since the 2000 (UNICEF and WHO, 2019). For example, the global population with access to at least basic drinking water services increased from 82% out of five billion people in 2000 to 90% out of 6.8 billion people in 2017 (UNICEF and WHO, 2019). Even though, there are inequalities between developed and developing countries, and also between rural and urban areas. Urban areas are better off in terms of accessing clean and safe drinking water from improved sources compared to rural areas (UNICEF and WHO, 2019). This implies that the world has a long way to go in terms of realizing fully the ambitious goal of Sustainable Development on achieving 'universal access for all and leaving no one behind by 2030'. Efforts to improve access to clean and safe drinking water in

*Corresponding author. E-mail: sjkabote@sua.ac.tz.

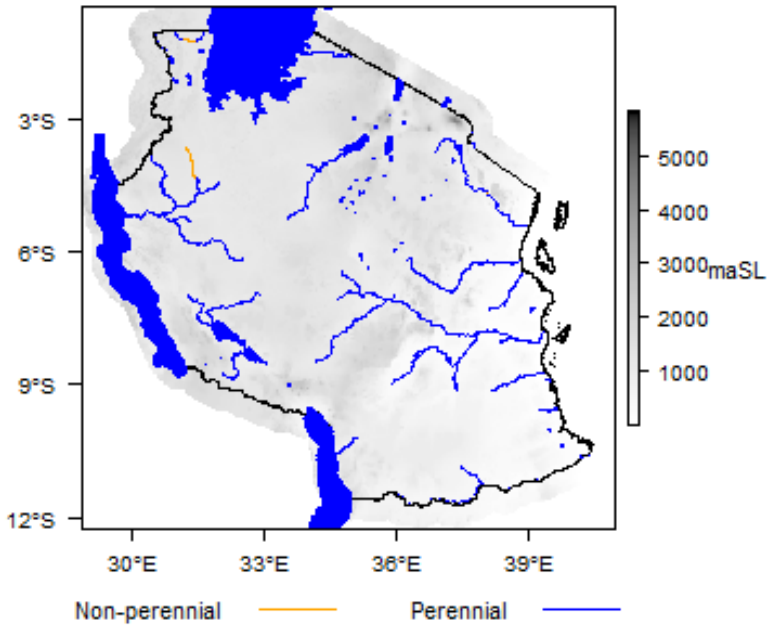

Figure 1. A map showing Lakes and Rivers in Tanzania (Sangea et al., 2018).
Source: Authors

Tanzania date back to the 1970s when the country implemented the socialism and self-reliance policy. During that particular period, the Government of Tanzania aimed to ensure that by 1990s all households could have access to safe drinking water within 400 meters (Sangea et al., 2018). As a country, Tanzania is endowed with abundant natural water sources mainly rivers and lakes (Figure 1). While most of rural areas in Tanzania depend on groundwater from communal boreholes for drinking water supply, urban areas depend on piped water supplies from groundwater sources. This implies that groundwater is critical for the living in Tanzania; and therefore needs governance to ensure sustainable supply and management. With that Tanzania has developed water governance mechanisms (Seward, 2015; URT, 2002; Murad, 2014).

In Tanzania, available information shows that by 2015, about 46% of the rural population had access to safe drinking water compared to 77.2% of the urban population (Sangea et al., 2018; Mgoba and Kabote, 2020). According to URT (2002) utilization and governance of water in Tanzania is regulated by statutory and customary laws. Maganga (2004) provides detailed information about customary norms and statutory laws for implementing Integrated Water Resource Management (IWRM) in the country since colonialism. The National Water Policy (NAWAPO) of 2002 emphasizes decentralized water governance in the country. This aims to ensure effective communities' participation in the water sector (URT, 2002; 2009; Zaag and Savenije, 2014; FAO, 2016). The NAWAPO and Water Supply and Sanitation Act No. 12 of 2009 consider Community Owned Water Supply Organizations (COWSOs) as the legal water governance actor at a local level in Tanzania. Other crucial water governance actors include village governments and Water Users Associations (WUAs) (Kabote and John, 2018).

The Community Owned Water Supply Organizations (COWSOs) are becoming pivotal for water governance in Tanzania in addition to other actors. Their function is basically governance in terms of enforcing water charge payments, enforcing penalties upon breach or failure to comply with water rules, encouraging sense of communities' ownership of water points, and encouraging community participation in planning and implementation of groundwater management (URT, 2009). Therefore, COWSOs have legitimacy to influencing groundwater users' behaviour and therefore critical for groundwater governance. To that effect, COWSOs and other governance actors should make sure that they practically implement governance principles for groundwater governance.

Tanzania uses a total of 1 265 000 m^3/day of groundwater; 50% supplied in rural areas (Sangea et al., 2018). However, groundwater shows high chloride concentration in Lindi, Mtwara, Singida, and Shinyanga regions (Sangea et al., 2018). The same source shows high concentration of carbon dioxide in Lindi and Mtwara. In addition, there is high fluoride concentration in Kilimanjaro, Arusha, Singida and parts of Shinyanga regions; high iron concentration in Mtwara and Kagera regions and high nitrate levels in Dodoma and Singida.

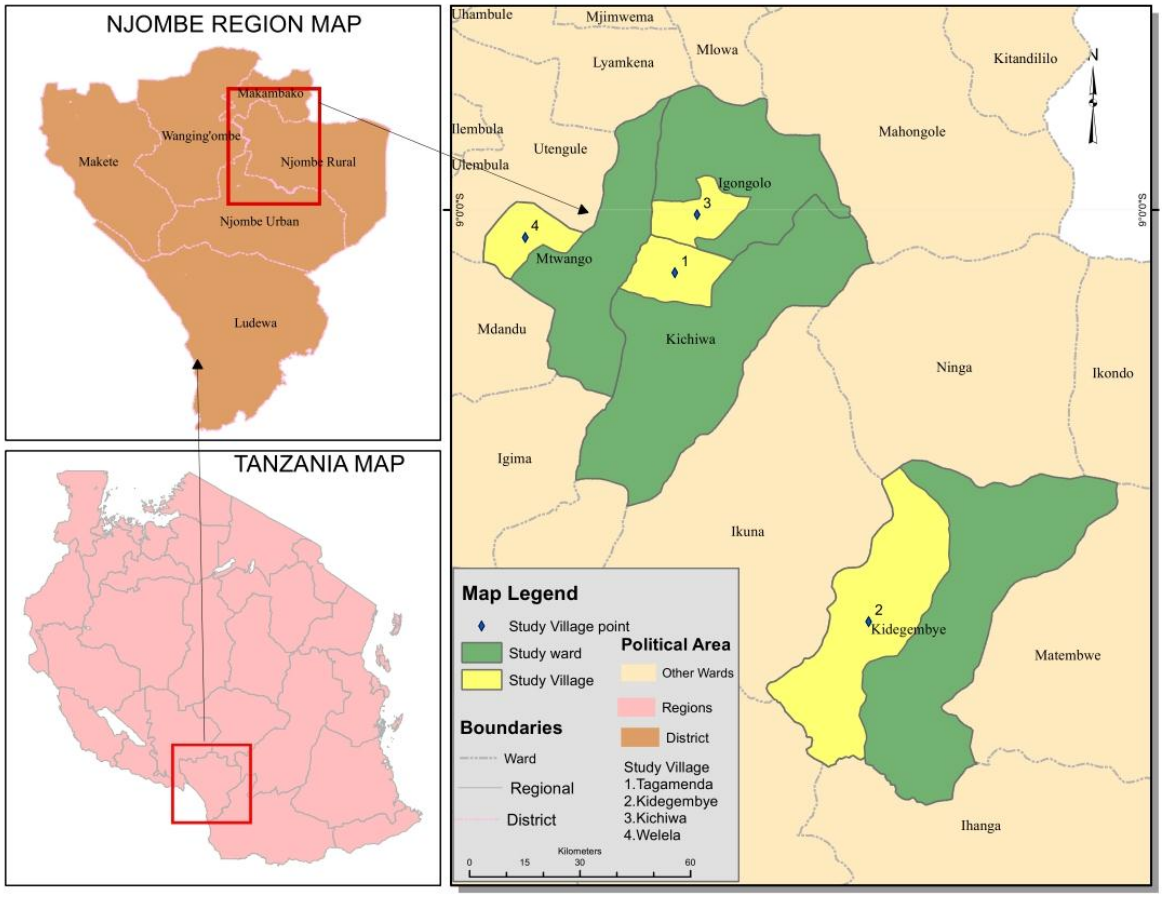

Figure 2. Location map of Njombe district showing the study sites.
Source: Authors

This implies that Tanzania has a long way to go in terms of controlling and removing groundwater pollutants for safe public consumption. Groundwater pollution is a governance and or management issue. There is no conclusive definition of groundwater governance in the literature. While some authors like Megdal et al. (2015) defined the concept as a comprehensive framework encompassing laws, regulations and customs for groundwater use as well as engagement of the public sector and civil society in governing the resource. Others including Foster et al. (2009) consider the concept as a collective action to enhance sustainable and efficient utilization of groundwater for the benefit of the people and ecosystems in general. An effective groundwater management requires a groundwater governance system; indicating that groundwater governance and groundwater management are inseparable. In Njombe district, groundwater experiences challenges like unsustainability of the water points (Holtslag and Mgina, 2016); pollution and illegal groundwater exploitation (Arduino et al., 2012; URT, 2016). This suggests that governance is not effective to manage the resource in the district. Therefore, this study explores practise of governance principles among groundwater governance actors particularly COWSOs, village governments and water users.

THE STUDY AREA

The study was conducted in Njombe District, Njombe Region, Tanzania (Figure 2). Data for this study were collected between September and November, 2019. The District is divided into three district councils namely: Njombe Rural District Council, Njombe Urban Council and Makambako Town Council. The District receives an annual average rainfall of 1 500mm (Madzengo, 2014), and it is characterised by a typical unimodal climate, that receives rainfall between November and April. The maximum monthly temperature is below 23.5 °C almost all months, excluding November and December in which the average temperature is 24.7°C. The minimum temperature ranges between 12 and 15°C from November to April, and is lower than 8 °C during June and July (Mtongori et al., 2015). The water sources in the District include river Ruhuji and natural springs (URT,

Table 1. Definitions of governance principles.

Variable	Operational definition	Sources
Participation	Opportunity for decision making, resource ownership, planning and budgeting	UNDP (1997), Burns et al. (2004), and Lockwood et al. (2010)
Accountability	Being responsible and answerable for groundwater matters	Lockwood et al. (2010) and Zaag and Savenije (2014).
Efficiency	Refers to the availability, accessibility and protection of groundwater resource	Abrha (2016)
Transparency	Availability and accessibility of information related to groundwater	Sanz et al. (2016) and Lockwood et al. (2010)
Equitability	Provision of an equal opportunity to the communities regardless of socio-demographic and economic differences	UNDP (1997) and Lockwood et al. (2010)
Collaboration	Working actively together among different actors	Graham et al. (2003)
Responsiveness	Reacting actively and timely on groundwater management matters	Abrha (2016)
Rule of law	Applying clearly and uniformly water rules to all groundwater users	Zaag and Savenije (2014) and Abrha (2016)

Source: Authors

2016). A number of water projects have been established for water supply in the district, and by 2016, the Njombe district had 65 water projects, 35 of them dealt with groundwater (URT, 2016). This implies that groundwater sources account for 53.8% of all water projects and therefore the district was a proper case to explore groundwater governance principles (Table 1).

METHODOLOGY

Research design, sampling procedures and sample size

The study adopted cross-sectional research design with a mixed method approach combining quantitative and qualitative techniques. The aim of the mixed method approach was to triangulate data collection methods as argued by Creswell (2014). Cross-sectional research design was adopted to explore information about governance principles. Purposive sampling was used to select Makambako and Lupembe divisions and four wards of Mtwango, Kichiwa, Igongolo and Kidegembye. The criterion for selecting divisions and wards was availability of groundwater points. The information about availability of groundwater points was obtained from Rural Water Supply and Sanitation Agency (RUWASA). Purposive sampling technique is recommended in social sciences because it focuses directly to an appropriate area for a study (Kothari, 2006). One village from each ward, making four villages, was selected using simple random sampling. The sampling frame comprised of 670 households of the study villages. From the sampling frame, a total of 250 head of households and spouses were selected using simple random sampling. The total sample size was determined by using the Yamane (1967) formula. One of the assumptions of the Yamane formula is that the population size should be finite. The Yamane (1967) formula is expressed as:

$$n = \frac{N}{1+N(e)2} \quad (1)$$

Where: n = Sample size; N = Population size, and e = Level of precision, which is 0.05.

Substituting the total number of households and the level of precision into equation 1, we get the total sample size equals to 250. In order to ensure that the number of sampled households in a particular village was proportional to the total number of households, a proportionate sampling was deployed by using equation 2, and the sample size per village is shown in Table 2. By substituting the values into equation 2, we get sub-samples as shown in Table 2.

$$a = \frac{n}{N*b} \quad (2)$$

Where: a = Sample size for each village; n = Total number of sampled households for 4 villages, N = Target households for 4 villages, and b = Target households in each village (Yamane, 1967).

Data collection methods and tools

Quantitative data were collected using household survey guided by

Table 2. Number of sampled households.

Village	Groundwater points	Number of households (N)	Sampled households (n)	Percentage of sample
Welela	6	210	78	31
Tagamenda	4	186	69	28
Kidegembye	6	154	58	23
Kichiwa	5	120	45	18
Total	**22**	**670**	**250**	**100**

Source: Authors

a structured questionnaire. The copies of questionnaire were administered to the household heads and or spouses who responded to the questions. This tool generated data related to, among others, the respondents' socio-economic and demographic characteristics and governance principles. Qualitative data were collected through Focus Group Discussions (FGDs) and key informant interviews. One FGD was conducted in each village making a total of four FGDs. Each FGD comprised 7 to 9 groundwater users making a total of 32 participants. The proportion of women participants ranged from 4 to 6 per group. Qualitative data are useful in explaining quantitative data (Creswell, 2014). A total of 9 key informants, mainly leaders, from COWSOs, Village Government Authorities (VGAs) and RUWASA were involved. Both FGDs and key informant interviews were guided by a checklist of items.

Data analysis

Qualitative data were analysed using content analysis. This involved transcription of information. For quantitative data, the variables of governance principles were assigned points based on a five-point scale, that is strongly agree (5 points), agree (4 points), neutral (3 points), disagree (2 points) and strongly disagree (1 point). During data analysis, the five-point scale was collapsed into a three-point scale, which is agree, neutral and disagree in order to ease interpretation. Then, the total number of respondents for each statement was counted to get the percentage distribution for agree, neutral and disagree. According to Pallant (2007), a three-point scale is appropriate for measuring social attributes such as attitude, awareness, perceptions, and knowledge. The One Way Analysis of Variance (ANOVA) was used to compare mean distance in meters from households to the groundwater points. The following formula as used by Ostertagova and Ostertag (2013) was adopted to calculate the mean distance.

$$\bar{x}_i = \frac{1}{n_i}\frac{\sum_{j=1}^{n_i} x_{ij}}{n_i} \quad (3)$$

Where: $\bar{x}_i$ = Mean distance of the i^{th} group (village); n_i = Number of observations in the i^{th} group (village); x_{ij} = Value of i^{th} observation at the i^{th} factor level (village)

ANOVA is a useful statistical technique that compares the mean difference for more than two groups (Pallant, 2007). In this study, villages are considered as independent groups. SPSS version 20 was used to generate descriptive statistics of respondents' socio-economic and demographic characteristics. SPSS was also used to compute percentage distribution.

RESULTS AND DISCUSSION

Respondents' socio-economic and demographic characteristics

The results show that exactly 50% of the respondents were females. In relation to age groups, 56.4% were between 40-59 years old. This indicates that the study area had active labour force. The results also show that 94% of the respondents depended on farming that was also a main source of income. Others depended on small scale businesses like tailoring, bricks making, and crop selling (Table 3). This implies that livelihood of the majority depended on farming. Welela, Kichiwa and Tagamenda villages mainly produced food crops whereas Kidegembye produced cash crops like tea and trees for timber production. According to URT (2018), agriculture provides employment to 66.3% of the Tanzanians. In addition, majority (68%) of the respondents had primary education whereas 20.4% had secondary level of education (Table 3). The results in Table 4 show that the mean age of the respondents was 43 years. This implies that majority of the respondents were adults. The mean number of persons per household was 5.6 higher than 4.9 persons reported at the national level in Tanzania (United Nations World Food Programme and World Bank, 2013) as well as 4.2 persons reported in Njombe District (URT, 2016).

Groundwater governance principles

The results on groundwater governance principles are presented in Table 5. About participation, 73% of the respondents participated to formulate by- laws in their localities. In some cases, the communities were represented by COWSOs in making by-laws, which is a legal actor for water governance in Tanzania. In addition, respondents showed a sense of ownership of groundwater points. With regard to accountability, the results show that five out of six statements of the accountability principle were poorly practiced (Table 5). This is because COWSOs did not work openly in terms of sharing success, challenges and progress on financial accounting with the communities of groundwater users.

Table 3. Respondents' socio-economic and demographic characteristics (n=250).

Variable	Welela	Kichiwa	Tagamenda	Kidegembye	Total
Sex					
Male	39(50.0)	23(50.0)	34(50.0)	29(50.0)	125(50.0)
Female	39(50.0)	23(50.0)	34(50.0)	29(50.0)	125(50.0)
Respondents age					
18-39	30(12.0)	17(6.8)	21(8.4)	24(9.6)	92(36.8)
40-59	41(16.4)	29(11.6)	43(17.2)	28(11.2)	141(56.4)
60 above	7 (2.8)	0(0.0)	4(1.6)	6(2.4)	17(6.8)
Relationship to the household head					
Head of household	38(15.2)	27(10.8)	43(17.2)	35(14.0)	143(57.2)
Spouse	32(12.8)	15(6.0)	22(8.8)	20(8.0)	89(35.6)
Daughter	2(0.8)	0(0.0)	0(0.0)	0(0.0)	2(0.8)
Son	6(7.7)	4(8.7)	3(4.4)	3(5.2)	16(6.4)
Respondents' marital status					
Married	57(22.8)	30(12.0)	45(18.0)	40(16.0)	172(68.8)
Single	4(1.6)	2(0.8)	1(0.4)	1(0.4)	8(3.2)
Divorced	2(0.8)	0(0.0)	0(0.0)	1(0.4)	3(1.2)
Widowed/widower	15(6.0)	14(5.6)	22(8.8)	16(6.4)	67(26.8)
Main source of income of the household					
Farming	65(26.0)	38(15.2)	56(22.4)	48(19.2)	207(82.8)
Business	11 (4.4)	8(3.2)	12(4.8)	10(4.0)	41(16.4)
Salary	1(0.4)	0(0.0)	0(0.0)	0(0.0)	1 (0.4)
Casual labour	1(0.4)	0(0.0)	0(0.0)	0(0.0)	1 (0.4)
Education level					
No formal education	3(1.2)	0(0.0)	3 (1.2)	2(0.8)	8(3.2)
Primary education	42(16.8)	33(13.2)	58(23.2)	37(14.8)	170(68.0)
Secondary school	21(8.4)	9(3.6)	5(2.0)	16(6.4)	51(20.4)
Tertiary education	12(4.8)	4(1.6)	2(0.8)	3(1.2)	21(8.4)
Respondents' main occupations					
Farming	70(28.0)	44(17.6)	65(26.0)	56(22.4)	235(94.0)
Small scale business	8(3.2)	2(0.8)	3(1.2)	2(0.8)	14(5.6)
Formal employment	0(0.0)	0(0.0)	0(0.0)	1(0.4)	1(0.4)

Number in brackets are percentage.
Source: Authors

Table 4. Descriptive statistics.

Variable	Minimum	Maximum	Mean	Std. Deviation
Age of respondent	23	78	43.0	11.8
Years of schooling of the respondent	0	13	8.1	2.5
Total number of the people in the household	3	9	5.6	1.3
Total number of years residing in the village	12	60	41.0	10.8
Annual income of the household from the main source of income	225 000	13 700 000	3 468 982	3 181 766.7

Source: Authors

The results on participation were contrary to Comte et al. (2016) and Masifia and Sena (2017) who argue that there is poor community participation in decision making in water projects in Tanzania. The contradiction between

Table 5. Respondents' responses of governance principles (n=250).

Governance principles	Statements	Disagree	Neutral	Agree
Participation	Owning properties for groundwater management	50(20.0)	30(12.0)	170(68.0)
	Budgeting resources for groundwater management	140(56.0)	96(38.4)	14(5.6)
	Allocating groundwater source points	17(6.8)	50(20.0)	164(65.6)
	Contributing resources for groundwater management	49(19.6)	105(42.0)	96(38.4)
	Formulating by-laws for groundwater management	66(26.4)	20(8.0)	183(73.2)
Accountability	Giving accounting reports	160(64.0)	40(16.0)	50(20.0)
	Accepting challenges related to groundwater management	55(22.0)	154(61.6)	41(16.4)
	Accepting challenges from groundwater users	183(73.2)	20(8.0)	47(18.8)
	Sharing lessons learned on groundwater management	194(77.6)	31(12.4)	25(10.0)
	Explaining openly the rationale for various decisions made	59(23.6)	154(61.6)	37(14.8)
	Discussing the accounting reports	215(86.0)tHIS	3(1.2)	32(12.8)
Transparency	Presenting the agenda of groundwater management in meetings	130(52.0)	50(20.0)	70(28.0)
	Providing financial statements	177(70.8)	20(8.0)	53(21.2)
	Allowing criticism from groundwater users	213(85.2)	21(8.4)	16(6.4)
	Giving or accepting apologies when matters have gone wrong	210(84.0)	18(7.2)	22(8.8)
	Sharing information from various governance structures	207(82.8)	18(7.2)	25(10.0)
	Knowing all source of funds if any	217(86.8)	8(3.2)	25(10.0)
Equitability	Treating all groundwater users with respect and dignity	76(30.4)	13(5.2)	161(64.4)
	Both men and women have opportunity of being leaders	87(30.8)	26(10.4)	137(58.8)
	Encouraging groundwater users to contribute resources	204(81.6)	16(6.4)	30(12.0)
	Witnessing fair source points allocation	88(35.2)	22(8.8)	140(56.0)
	Involving all people on groundwater management regardless their income differences	54(21.6)	13(5.2)	183(73.2)
	Involving all people on groundwater management regardless their age differences	100(40.0)	40(16.0)	110(44.0)
Efficiency	Groundwater points are well protected against pollution	101(40.4)	15 (6.0)	134(53.6)
	Mutual respect among groundwater users to access water	88(35.2)	5 (2.0)	157(62.8)
	Groundwater points is nearly allocated at the household	91(36.4)	50(20.0)	109(43.6)
	Availability of groundwater	76(30.4)	19(7.6)	155(62.0)
Rule of law	Paying the amount of contributions as agreed	130(52.0)	60(24.0)	60(24.0)
	Prohibiting all socio activities around groundwater points	60(24.0)	66(26.4)	124(49.6)
	Giving sanctions to all people who breached water rules regardless their social or economic status	72(28.8)	128(51.2)	50(20.0)
	Groundwater management focus on issues not on a person	105(42.0)	100(40.0)	45(18.0)

Table 5. Contd.

Responsiveness	Timely disseminating the information	191(76.4)	37(14.8)	20(8.0)
	Repairing groundwater infrastructures timely when they have to be repaired	160(64.0)	46(18.4)	44(17.6)
	Contributing timely the resources for groundwater management when is needed	141(56.4)	44(17.6)	65(26.0)
	Groundwater users receive timely groundwater related financial reports	166(66.4)	47(18.8)	37(14.8)
Collaboration	Addressing groundwater management challenges	195(78.0)	15(6.0)	40(16.0)
	Creating community awareness on groundwater management	211(84.4)	20(8.0)	19(7.6)
	Encouraging groundwater users to participate on groundwater management	176(70.4)	29(11.6)	45(18.0)
	Enforcing various by- laws of groundwater management	180(72.0)	40(16.0)	30(12.0)

Numbers in brackets are percentage.
Source: Authors

the results in this study and that of Comte et al. (2016) and Masifia and Sena (2017) is explained particularly by a presence of COWSOs in Njombe District that represent the communities in water governance including by-laws formulation. Respondents (above 50%) showed that financial reports were not shared with groundwater users; COWSOs did not accept views of the groundwater users; COWSOs did not share lessons learned and financial reports (Table 5). Quantitative results were in line with COWSO's key informants' results in Kichiwa. On one hand, the reason for not sharing financial reports, according to COWSOs was that COWSOs did not collect water charges from groundwater users because they were reluctant to pay charges and hence no need of sharing financial reports with water users. On the other hand, RUWASA argued that the problem of not paying water charges persisted because of less commitment of COWSOs to create awareness of importance for paying water charges among groundwater users implying that COWSOs were not that much effective in terms of governance. There was also poor transparency among governance actors. For instance, 86.8 and 85.2% of the respondents were not aware about sources of funds for groundwater development and they were not free to criticise water governance actors, respectively (Table 5). There was also poor transparency with regard to discussions during village assemblies; provision of financial reports; giving or accepting apologies when groundwater matters went wrong; and sharing communication and information from groundwater governance actors (Table 5). This implies that groundwater governance actors did not consider transparency. This is unquestionably explained by poor knowledge of transparency among governance actors particularly COWSOs. The results concur with those by Mandara et al. (2013), Comte et al. (2016) and Kabote and Gudaga (2018) who found that groundwater governance in Tanzania faces poor transparency among governance actors in Comoros Islands, Kenya and Tanzania.

On equitability, which is a state of providing equal opportunity to the communities to access groundwater information, 73.2% of the respondents were involved on groundwater matters regardless their income differences; and 64.4% agreed that all groundwater users were treated with respect and dignity to access groundwater points (Table 5). Other statements, which were well practised, include opportunity for men and women to hold leadership positions in COWSOs and fairly allocation of groundwater points in the communities (Table 5). This implies that equitability was effectively practised in the study area, possibly because most of the groundwater points were public and therefore everybody had an equal opportunity to access the water. The results are not in agreement with those of Mandara (2014); Nganyanyuka (2017); and Sudi et al. (2019) who argue unequal women leaders in water governance actors like COWSOs in some parts of Tanzania suggesting that more job in terms of equitability needs to be done. Furthermore, the results showed that protecting groundwater points against pollution, accessibility of water by groundwater users and availability of groundwater were efficient (Table 5). This is explained by a reason that all groundwater points were covered to protect contamination, and the water was accessible to all households. Using ANOVA, the overall mean distance from

Table 6. Distance in meters from the respondents' households to the groundwater points.

Village	N	Mean	Std. deviation	F	P-Value
Welela	78	380.13	181.140		
Kichiwa	46	430.83	199.921		
Tagamenda	68	431.43	200.230	2.580	.054
Kidegembye	58	355.17	159.365		
Total	**250**	**399.39**			

Source: Authors

households to groundwater points was 399 m (Table 6). This implies that groundwater was accessible close to the households within a distance of 400 m recommended by the National Water Policy of Tanzania of 2002 (URT, 2002). This is in line with Comte et al. (2016) and Ngasala et al. (2018) in terms of accessibility of groundwater.

The difference in distance from households to the groundwater points between the villages was not statistically significant at 5% level of significance (Table 6). The lowest mean distance was about 355 m in Kidegembye while the highest mean was about 431 m in Tagamenda. Some villages like Kidegembye had many groundwater points making every household close to the groundwater point. Kidegembye had 6 groundwater points with 154 households while Tagamenda had 4 groundwater points with 186 households; suggesting that more groundwater points should be constructed in bigger villages to ensure that water users access the water within a distance of 400 meters. About the rule of law, 49.6 % of the respondents showed that COWSOs had by-law that prohibited households to undertake socio economic activities around groundwater points (Table 5). Quantitative results were in line with information from COWSOs and village authorities. The aim of this restriction was to keep groundwater points safe and free from pollution. To implement the by-law, COWSOs imposed a fine for those who breached the law. The amount of the fine ranged between TZS 20 000 (USD 8.6) and 50 000 (USD 21.56). In terms of responsiveness, 76.4% and 66.4% of the respondents reported that COWSOs did not disseminate timely information on groundwater management and financial issues, respectively (Table 5). Other aspects of responsiveness that were poorly practised include repair of groundwater infrastructures and contribution of funds for groundwater when needed. The issue of COWSOs poor responsiveness was also reported by the District Water Department Officer as follows: "*...COWSOs are not knowledgeable on groundwater governance.* This implies that COWSOs had limited knowledge and skills to deal with governance and therefore poor responsiveness.

Realizing poor responsiveness of the COWSOs, the Water Supply and Sanitation Act No.5, of 2019 transformed them into Community Based Water Supply Organizations (CBWSOs) to improve groundwater governance in the country (Fierro et al., 2017). Some improvements considered in the proposed CBWSOs include: involvement of professionals like water technician and an accountant who should be a technician level three in accountancy. In addition, CBWSOs are owned by the village government and the communities. This is different from COWSOs which are owned by the communities alone (URT, 2019a). Unquestionably, the involvement of professionals in CBWSOs is likely to improve groundwater governance particularly responsiveness. About collaboration, 84.4% of the respondents reported that, COWSOs did not collaborate with the village governments in creating community awareness of groundwater governance (Table 5). Other areas where groundwater governance actors did not collaborate include: addressing groundwater challenges, encouraging groundwater users to participate in groundwater management and enforcing by-laws for groundwater governance (Table 5). This is attributed to lack of knowledge about governance among groundwater actors especially COWSOs. The results are in line with those of Masifia and Sena (2017); and Kabote and Gudaga (2018). This negatively affects opportunities such as sharing resources, experience, and knowledge about groundwater governance. The idea that CBWSOs should be owned by village governments and the communities is likely to produce positive results with regard to groundwater governance.

CONCLUSIONS AND RECOMMENDATIONS

The results have shown that most of the governance principles were poorly practised. Participation, equitability and efficiency were well practised while transparency, accountability, rule of law, responsiveness, and collaboration were poorly practised. It is clear from the discussion that groundwater management was also poor because of poor practise of the governance principles. The relationship between COWSOs and village governments; and poor knowledge of governance principles among COWSOs and village governments explain poor practise of groundwater governance principles. With that conclusion, the governance actors

including COWSOs; and villages governments should effectively practise governance principles particularly transparency, collaboration, rule of law, responsiveness and collaboration. This will motivate groundwater users and other governance actors to engage seriously in groundwater management. In addition, governance actors should strengthen relationship between and among themselves. This can help fostering mutual sharing of experience and opportunities in addressing groundwater governance. Furthermore, the local government at a district level should strengthen understanding and implementation of good governance among groundwater governance actors recognized by the law whether including COWSOs and village governments to enable them practise governance principles effectively for groundwater management.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interest.

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