

# Cultural Aspects Constraining Mine Water Supply Chain Management in ASAL Areas of Kitui County, Kenya

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## Abstract

Kitui County receives low levels of rainfall annually thus considered as Arid and Semi-Arid (ASAL) area. The community has formed many cultural imaginations about water ensuing from scarcity and insufficiency of the commodity in the area. This study sought to establish how community livelihood, beliefs, norms and customs, poverty, rituals and gender involvement constrained mine water supply chain management. The findings showed that there is difficulty in accessing water and the quantity and quality available do not match community domestic needs. Consensus building and factoring in of cultural aspects is key in ensuring success of mining and extraction activities.

**Keywords:** cultural aspects, mine water, ASAL, water supply chain management

## Introduction

Kitui County topography is generally low-lying and it falls in the semi-arid climatic zone. It receives an average rainfall of 900 ml a year. Water as a resource is scarce in the area, and like any other ASAL area, challenges faced affect the performance of the community. The county, which is home to Kamba community, is faced with recurrent drought periods during the dry seasons in the country. During these periods, there is many reported human and animal deaths due to starvation and lack of water, diseases, malnutrition and dehydration (Shelmith 2013). Countywide estimates indicate that 42% of Kitui County's population has access to at least a basic water service (Nyaga 2019). Kitui County has been recently discovered to host several minerals, thus the need for water as a resource to be conserved and managed to promote extraction activities. Mining requires water for the extraction of minerals that may be in the form of solids, liquids or gases.

The demand for adequate water supply in Kitui County is growing daily as the availability and supply of this important commodity becomes very scarce. Population growth and climate change adds pressure to an already stressed watershed in the

county. The resulting conflict arising from the shortage of water for both domestic use and industrial use is what is facing most of the regions located in the ASAL areas (Mwaguni, Ruwa, Odhiambo-Ochiewo & Osore 2016). Fernando, Ilankoon, Syed and Yellishetty (2018) argue that mining uses water primarily for mineral processing, dust suppression, slurry transport and employees' needs. In most mining operations, water is sought from groundwater, streams, rivers and lakes, or through commercial water service suppliers. However, often, mine sites are located in areas where water is already scarce and, understandably, local communities and authorities often oppose mines using water from these sources (Abuya 2016). It is no different in Kitui County. Water resource management is an integral part of mining. Despite successful efforts to manage water usage more efficiently, increasingly tougher environmental rules are hiking miners' costs and risks, particularly to those operating in arid regions or close to populated communities (Van & Schreiner 2014). Briefly, Kitui County faces the challenge of insufficient water levels making the community form many cultural imaginations about water, which constrain mine water supply chain.

## Methods

The study adopted an explanatory research design. The study required the collection of quantifiable information, which describe the research problem by asking individuals about their opinions and attitude on the cultural aspects constraining mine water supply management. Both primary and secondary data sources were applied in order to achieve the set objectives. Primary data included local views, opinions and perceptions related to mine water supply and the challenges faced. The primary data was obtained through households’ visits, field observations and face-to-face interviews from officials in charge of the water sector in the county. Secondary data was obtained from previous studies that were carried out on cultural factors constraining mine water supply management. Relevant publications were other data sources used to relate to the study. Published reports like journals, books and reports also helped to provide information. A total of 300 households were sampled, with medium and low income residential well represented. Selected water bodies in Kitui County being the most focused institutions had a lot to offer in terms of response. Purposive sampling was used to select the households and other actors in the water sector. Data was collected using various methods including questionnaires, oral interviews, field observations and review of literature. Data was analysed using descriptive analysis and presented using statistical techniques. Thematic analysis, which is a data reduction and analysis strategy by which qualitative data are segmented, categorized, summarized and reconstructed in a way that captures the important concepts within the data set, was used.

## Findings

### *Water Scarcity*

Respondents were asked to indicate the number of kilometers they walk/travel to get water to estimate the nearness of water sources to the households in Kitui County. Opinions on the sufficiency of water in the county was also sought. This was done in a five level semantic differential questionnaire.

The findings from Table 4.1 indicate that majority of the respondents walk for 30-45 Kilometers to access water, as 18.33% walk for 15-30 Kilometers, 10.67% walk for 1-15 Kilometers and 15% walk for more than 45 kilometers. Only 7.67% walk for less than a kilometer meaning that either they are near the water sources or they have tapped water in their homesteads. This shows that there is difficulty in accessing water in Kitui County making water an important, scarce and valuable resource to the dwellers of the county. On water sufficiency, 47.67% and 43.33% of the respondents indicated that water is extremely scarce and scarce respectively in Kitui County. Out of the 300 households, 0.67% and 3.33% was of the opinion that there is adequate water supply in the region as 5% opted to remain neutral to the enquiry. Views from the water bodies indicate that Kitui County is faced with serious water scarcity challenges. Recurring droughts have diminished water supply, high rates of deforestation have severely reduced water catchment capacity, and population growth and climate change have compounded water shortages. Scarce and coveted, water is a precious commodity and the quantity and quality available in Kitui County often do not match community domestic needs.

**Table 1** *Water Scarcity.*

Number of Kilometres	Percentage	Water Insufficiency	Percentages
0-1 Kilometres	7.67	Very adequate	0.67
1-15 Kilometres	10.67	Adequate	3.33
15-30 Kilometres	18.33	Neutral	5
30-45 Kilometres	48.33	Scarce	43.33
Above 45 Kilometres	15	Extremely scarce	47.67
<b>Total</b>	<b>100</b>		<b>100</b>

**Table 2** Monthly Income generated.

Monthly Income (Ksh)	Frequency	Percentage
0-5,000	105	35
5,000-20,000	70	23.33
20,000-40,000	55	18.33
40,000-60,000	45	15
Above 60,000	25	8.33
<b>Total</b>	<b>300</b>	<b>100</b>

### Poverty Level

According to the information gathered from the questionnaires, the level of income from the residents of the county is low. This made evident that poverty exists in the area, as there were people of percentage 35% who earned less than 5,000 shillings monthly, 23.33% of others earned 5,000-20,000 Shillings, 18.33% earned between 20,000-40,000, 15% earned between 40,000-60,000 as 8.33% of the respondents earned a monthly income of above 60,000 Kenya shillings. The county has high levels of poverty and the local community does not have the available infrastructure and resources to access enough water. Water conservation and storage is challenge to them, as they have no necessary facilities to conserve and access water.

### Literacy rate

From the results in Table 3, 31.67% represents the respondents who have schooled up to primary school only as 28% have studies up to secondary school. Few respondents, 24.33% and 8.33% have studied in tertiary institutions earning certificates, diplomas and undergraduate degrees. The rest of the percentage that is 7.67% have studied in universities earning postgraduate degrees. This being evident that the level of education in the area is poor; it brought up a challenge in mine water supply management, as people do not have the knowledge on need for mining activities. There is a lot of illiteracy by the people in the community that makes it difficult to implement mining activities in the region using water as a critical ingredient. The community lacks enough knowledge on good measures to conserve and manage water

**Table 3** Literacy Level of Respondents.

Category	Frequency	Percentage
KCPE and Below	95	31.67
KCSE/O-Level	84	28
Diploma& Certificate	73	24.33
Undergraduate	25	8.33
Postgraduate	23	7.67
<b>Total</b>	<b>300</b>	<b>100</b>

as a problem. This create stress to the available water resources such as rivers, due to activities such as sand harvesting. The findings also indicate that, women in the county are very much disadvantaged due to the prevailing and past cultural factors that discriminated them. The community believed that women should not go to schools, as their place is the kitchen, a culture that is slowly eroding.

### Community Livelihood

Most of respondents concentrated on crop growing (42.66%) as 25% used land for grazing activities; they owned large livestock. A few percentages of 1.67% practices mining and mineral processing which is new to the region. Out of the respondents, 18.67% practiced entrepreneurship and small business as 12% were in formal employment especially from government institutions and local private firms. The entrepreneurship and small business activities includes selling water for a livelihood. The community way of livelihood acted as a hindrance to effective mine water supply management as they do not pay attention to water demanding activities. Much of the water present in the county is directed to livestock management, crop growing and household needs and not for commercialization or industrial use.

**Table 4** Community Economic Activity.

Category	Frequency	Percentage
Growing Crops	128	42.66
Livestock keeping & Grazing	75	25
Mining	5	1.67
Entrepreneurship & Small Business	56	18.67
Formal Employment	36	12
<b>Total</b>	<b>300</b>	<b>100</b>

*Table 5 Perceptions on cultural aspects constraining mine water supply.*

Respondents' Perceptions On Mine Water Supply	1	2	3	4	5
The Kamba community view water as a precious and scarce commodity thus a great affection to water sources and water use	0%	0%	3.33%	33.3%	63.33%
Mining activities consumes a lot of water leaving little for domestic and agricultural use to locals	1.67%	3.33%	9.33%	66.67%	19%
The livelihood of a community will be destroyed should the water get polluted/quality degrade or water supply fall resulting from use of water in mining	0%	0%	13.33%	46%	40.67%
Water should be reserved for use in the uncertain future as droughts are common and foreseeable in the county	1.33%	12.67%	24.67%	35.33%	26%
Mining companies extract local resources for their profits leaving the community vulnerable than they found them	9.33%	11.67%	21.33%	35%	22.67%
Involvement of the women by miners on matters of water supply is a hindrance to effective implementation and use of water in mining activities	11.33%	12%	30.33%	30.33%	16%
Water supply and Excavation in protected and holy shrine areas cause the local communities to perceive the excavators as the unnecessary evil	20%	20%	20%	24%	16%

Key: 1–Not at all; 2–Small Extent; 3–Moderate Extent, 4–Large Extent, 5–Very Large Extent

The findings of this study indicate that the Kamba community view water as a precious and scarce commodity thus the community has a great affection to water sources and water use. Scarce and coveted, water is a precious commodity and the quantity and quality available in Kitui County often do not match community domestic needs. The community believes that mining activities consumes a lot of water leaving little for domestic and agricultural use to locals. The community believes that water should be reserved for use in the uncertain future, as droughts are common and foreseeable in the county. The community believes that using water in mining pollutes the existing sources of water. Mining can have harmful effects on surrounding surface and groundwater, if proper precautions are not taken. Large amounts of water used for mine drainage, mine cooling, aqueous extraction and other mining processes, increases the potential for chemicals to contaminate ground and surface water, which ultimately has an effect on the health of the local population.

Majority of the households agreed that mining companies extract local resources for their profits leaving the community more vulnerable than they found them. The feeling of not benefiting from the mining activities triggers the unwillingness of the community to facilitate the mines with water supply. Culture of the Kamba community defines the rights, responsibilities and relations between men and women. In Kitui County, the culture

is largely patriarchal, giving men dominance over women thus calling for their involvement on mining and water projects. Involvement of females, by miners, on matters of water supply chain management is a hindrance to effective implementation and use of water in mining activities. Men in the county are more involved in decisions. The men are involved in activities that provide them with more access and control of resources, hence decision-making power (Macksembo 2020).

Water supply and excavation in protected and holy shrine areas cause the local communities to perceive the excavators as the unnecessary evil that is a threat to their traditions. This calls for resistance and use of charms for protection. In Kitui County, the communities value their African traditions that is deep rooted in their culture. From the views of the respondents the community had discovered own methods/cultural solutions of managing drought and water problems through traditional customs and rituals. The community believed that lack of rains in the area is a sign of a spiritual imbalances corrected by rites and rituals to appease the gods. Due to the persistent issues of rain unpredictability and lack of modern/Western solutions to prevent drought, the residents of the county had to discover their own methods of managing the environment by invoking traditional customs. Water insufficiency and scarcity forced community members to pull out drums, rattles, whistles, and special dance garbs to invoke the blessings of water spirits

and deities. This justifies the great affection, strong beliefs and value, the community has on water thus responsibly using it for domestic purposes and rarely willing to use water for commercialization or industrial use.

## Conclusions

From the findings, it can be concluded that there is difficulty in accessing water and the quantity and quality available do not match community domestic needs in Kitui County; making water, popularly known as *Kiw'u*, an important, precious and valuable resource to the dwellers of the county. The county has high levels of poverty, illiteracy and the local community has formed several cultural imaginations including beliefs, norms, customs and livelihood, constraining the supply of water for mining activities. The community protects the use of water for mining in the area hindering implementation of mining and extraction activities in the region. Vandalism of mine water supply, opposing supply of water to mining sites is common in the area. There is need for adequate civil education to be undertaken among the resident communities to create awareness that the use of water for mining activities does not mean wastage. Mining companies should also be encouraged to share the water with the residents by undertaking corporate social responsibility activities. The governments, both national and local should work on modalities to ensure that there is sufficient water availability. There is need to build consensus through public participation and factoring in the cultural aspects of the local community before initiating mining extractions and excavations.

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