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Assessment of Community Knowledge, Attitudes, and Perceptions Toward Effluent Quality Discharged from the Shirere Wastewater Treatment Plant to the Isiukhu River, Kakamega County, Kenya

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ABSTRACT

For waste removal, advanced infrastructural technologies can be adopted in the drainage channels of effluents into water bodies though they are limited and scarce. The aim of the study was to asses community knowledge, attitude and perception towards effluent quality discharged from Shirere wastewater treatment plant up to river Isiukhu. Correlation and descriptive survey were the main research approaches adopted. The measurement of the knowledge, perception and attitude was limited to only the community members, as well as Kakamega County Water and Sanitation Company (KACWASCO) staff members. The study was anchored by the risk management theory to demonstrate the vulnerability of community hazards like water pollution. The social-economic sampling approaches applied were stratified for the community members and random for the KACWASCO workers. The population targeted was eighty community members and four KACWASCO staff members. The questionnaires were pretested through a pilot study to ascertain their reliability. This pre-test was conducted at a different Waste Water Treatment Plant (WWTP) at Nabongo. The Pearson coefficient (r) was used to compute the correlation coefficient between the two test scores. Data was analyzed using regression and correlation methods. For socio-economic, reliability test was administered by use test- retest method. A code book was prepared and scores of the first test correlated with scores of the second test, and Pearson product moment of correlation was computed using SPSS software version 21.0. By applying the analysis of variance (ANOVA), researcher was able to determine whether differences observed between groups are likely due to actual variations in their perceptions or simply due to chance. From the reliability test, all of the variables obtained had Cronbach's Alpha greater than 0.7, indicating that they met the necessary 0.7 for data internal consistency. The Bartlett's test for validity was examined using the chi-square test, which revealed that all of the variables were significant at the 5% (0.000) level of significance. Only 82 of the 84 questionnaires provided to the sampled respondents (KACWASCO staffs and community members) were filled out and returned in this study. From the study findings the value of R-square was 0.429. The ANOVA test indicated that in this model the independent variable namely; knowledge of the residents is important in predicting of waste water treatment as indicated by significance value=0.002 which is less than 0.05 level of significance ($p=0.002 < 0.05$). Additionally, the response under attitude and perception, the value of R-Square was 0.045 which implied that, 4.5% of variation of Wastewater Treatment Plant in Shirere was explained by attitude and perception of the residents within the area. The study also revealed that attitude and perception of the residents in Shirere had a significant influence on wastewater treatment at Shirere in Kakamega County (t-statistic = 25.674, p-value = $0.045 < 0.05$). Therefore, it was concluded that, at 5% level of significance, indicating that community knowledge, perception and attitude had a positive influence on waste water treatment at Shirere in Kakamega County. Likewise, for every unit increase in attitude of the residents there was a corresponding increase in wastewater treatment at Shirere in Kakamega County by 0.628. The study recommended that, the community members need more sensitization on matters pollution as revealed by this study.

Keywords: Attitude, Knowledge, Perception, Wastewater Treatment Plant

I. INTRODUCTION

Human health, environmental sustainability, and social economic progress all depend on the quality of the water. The high population density, especially in Africa, has increased the predicted amount of pollution exposure in low- and middle-income countries (Boretti & Rosa, 2019). However, enough clean water sources for everyone are getting harder to come by as the world's population rises. Approximately 1.8 billion people drink tainted water, which puts them at risk for polio, typhoid, dysentery, and cholera (Castella et al., 2017). Accordingly, efficient wastewater treatment would produce fertilisers and other recyclable resources in addition to helping to preserve our ecosystems (Corocoran, 2010; Afroz et al., 2014; Jayaswal et al., 2018).

For instance, the 390-kilometer-long Athi River, home to millions of people, is heavily contaminated by cyanobacteria (Takawira, 2021). The Nairobi River, an Athi River tributary, is the source of these effluents. The latter's water frequently becomes brown during the rainy season as a result of surface runoff. Eventually, as cyanobacteria algae grow on the water's surface, it turns greenish over time. The World Health Organisation [WHO] (2005) states that, certain species of cyanobacteria create toxins that are harmful to humans and animals alike. In a comparable situation, the rivers Isiukhu and Yala supply water to Kakamega Town and the surrounding area.

The Nzoia Cluster Two Assessment (WHO, 2005) shows that while River Yala waters are abstracted at Tindinyo, these gathers water from the River Isiukhu at Savona. The average daily production of water from these sources is estimated to be 8696 m3/day, compared to an average daily consumption of 12,796 m3/day, or 44% of the total demand. The majority of business owners have dug shallow wells to make up the difference. However, the bulk of residents in Kakamega's slum housing obtain their water from open springs that have been contaminated by pit latrines, and some employ roof catchment systems and tanks to collect rainwater for household use from their rooftops.

Like other metropolitan places, Kakamega Town's water quality is impacted by inadequate municipal solid waste disposal management systems. The Kakamega County sewage network serves the remainder of the town, with the exception of standalone septic tanks for household wastes in residential areas. Sewerage wastes are subsequently dumped into the River Isiukhu after passing through the Shirere Wastewater Treatment Plant. The town also has two other treatment facilities: MMUST Treatment Works and Kambi Somali Treatment Works. The Shirere Waste Water Treatment Plant (WWTP), the study location, was found to have low filtration efficiency.

1.1 Statement of the Problem

According to Kenya's 2019 population census, 31% of people reside in cities (Kenya National Bureau of Statistics (KNBS), 2020). Growing numbers of people living in towns without the corresponding planned urban infrastructure have led to a number of environmental issues, which are made worse by the incapacity of municipal authorities to handle vast amounts of wastewater generated (Ogara, 2019). According to Koop & Leeuwe (2017), these urban regions have had difficulties as a result of inadequate resources, subpar infrastructure, and faulty cleanup technology. The absence of effluent quality monitoring protocols at wastewater treatment facilities was one of the other issues. Like their counterparts in other urban locations, residents of Kakamega town are susceptible to illness outbreaks due to ineffective sewerage infrastructure (Okari, 2019).

The methods used today to treat water and wastewater in metropolitan areas, such as stabilization ponds, conventional treatment, onsite treatment, and offsite treatment, are insufficient (Wang et al., 2014). Stabilization ponds are an appealing option in both developed and developing nations due to their ease of use and low cost. However, inadequate maintenance, inadequate design, and overloading the ponds lead to low-quality wastewater production, which is one of the concerns with stabilization ponds. Either the facultative, aerobic, or maturation ponds are not arranged in sequence, or an aerobic pond is not included in the design.

According to Geribun et al., (2022) the general knowledge on treatment technologies, processes, and reuse risks are still low in East African Countries. Similarly, as the technical infrastructural challenges affect the performance of Shirere waste water plant, the communities' input through their knowledge, altitude and perception will improve the process. In depth research in the three social variables is vital to inform the stakeholders on the best way in terms of managing the WWTP. By offering current data on social Knowledge, attitude and Perceptions in the community, this study will facilitate the adoption of these environmentally beneficial technologies that benefit both people and the environment. Furthermore, the results ought to be beneficial in formulating protocols for carrying out wastewater initiatives, such as integrating wastewater treatment systems into a biodiversity preservation portfolio.

1.2 Research Objective

The objective of the study to was to asses community knowledge, attitude and perception towards effluent quality discharged from Shirere wastewater treatment plant up to river Isiukhu.

II. LITERATURE REVIEW

In the realm of environmental management and community engagement, understanding public perceptions, attitudes, and knowledge is crucial. This is particularly evident in the context of wastewater treatment facilities such as the Shirere Wastewater Treatment Plant (WWTP). The Assessment of community attitude and perspectives on such facilities can provide invaluable insights into public acceptance, concerns, and areas for improvement. Furthermore, in the numerous emerging nations' expanding towns and cities, water has become a scarce resource. It is also true that there is currently strain on water resources as a result of economic development and human activity, and that these resources are not uniformly distributed in place and time, (Ling et al., 2013).

2.1 Theoretical Review

2.1.1 The Theory of Risk-Management

The theory of risk-management is based on three basic concepts: utility, regression and diversification. Utility method was first proposed in 1738 by Daniel Bernoulli, resulting in the decision-making process where people have to pay more attention to the size of the effects of different outcomes (Yu 2022). In the event of a calamity, the community has historically been seen as the helpless object of assistance. The effect of outside help makes the community less inclined to use its own coping mechanisms to deal with disasters and the threats they face, even when they are capable, knowledgeable, and skilled in handling the hazards they face on a daily basis.

Depending on their ability and susceptibility to risks, people are affected by disasters differently. Vulnerability is defined by the International Strategy for Disaster Reduction (ISDR), (2009), as long-term variables and situations that negatively impact a community's capacity to respond to, manage, or recover from the debilitating impacts of the occurrence of hazards or disaster events. Furthermore, according to Mileti (1999) and McEntire (2001), vulnerability is determined by an individual's ability to cope with the potential effects of a hazard, regardless of whether the context is the community, the economy, or a structure. In most communities, and informal settlements specifically, poverty is the root source of vulnerability. Since the poor are already have limited access to resources for a sustainable daily life, such as food security and the provision of basic amenities like water, sanitation, and shelter, the impoverished are especially vulnerable to disasters.

2.2 Empirical Review

Even though wastewater treatment technology has advanced greatly, many developing nations have not adopted these environmentally friendly initiatives widely (Gerubin et al., 2022). Inadequate knowledge of the community's safety may make it difficult to use treated wastewater for agricultural purposes in some areas, which could lead to wastewater treatment facility failures globally (Scott et al. 2009). Despite increased efforts, the community and government have largely adopted outdated and non-progressive modern wastewater treatment techniques, such as CWs, at a relatively low rate. According to previous studies, the general public's knowledge, attitudes, and perceptions (KAPs) about a project's purpose, advantages, and implementation outcomes are the only factors that determine whether the community and government would adopt it, (Saad et al. 2017).

Kimongu & Obiri (2012) stated that attitudes, ignorance, and a lack of knowledge all contribute to the problem of assuring the safety of drinking water. In Kakamega Town, Western Kenya, peri-urban households' knowledge, attitudes, and practices regarding the gathering, purification, and storage of drinking water were examined in this study. Administered to the households and key informants on a Likert scale of 1 to 5. The majority of respondents, according to the findings, were aware of the best practices for gathering, treating, and storing water. They did not, however, practice them correctly. A few respondents' attitudes went against the goals of obtaining clean drinking water.

Regardless of the depth of the scientific evidence supporting wastewater reuse projects, perceptions and public acceptance of the practice are acknowledged as critical criteria for their effective introduction (Michetti et al. 2019). Planning an efficient use of the resource also requires knowing how the community views wastewater treatment programs and the reuse of treated wastewater. According to Michetti et al., (2019), understanding people's beliefs, behaviors, gaps in knowledge, and the current restrictions on water reuse patterns is facilitated by acknowledging these perspectives.

Furthermore, limited acceptance of reusing treated wastewater for drinkable applications was revealed in research by (Wilson & Pfaff, 2008; Miller 2006; Dolnicar & Hurlimann 2010; Dolnicar et al.2011, and Chfadi et al. 2021).The resu lts of this study indicate that spreading knowledge about the safety of treated wastewater is not as easy as it might be t o increase community acceptability of the potable reuse of treated wastewater.Since there are varying preferences and points of view within the community that need to be developed, the community's opinions regarding the acceptance or rejection of reusing treated wastewater may alter in response to new information.

However, several of the people who responded to our survey expressed support for irrigating farms, urban gardens, sports grounds, and woods with wastewater that has been cleaned. These results are consistent with those of Kantanoleon et al. (2007), Khanpae et al., (2020), and Robinson et al., (2005), whose respondents expressed support for comparable irrigation techniques but opposition to any practices that require direct contact with treated water, like vegetable farming. In line with previous studies (Kantanoleon et al. 2007), we discovered that the community's apprehension about the water's safety may be caused by a fear of chemicals (70.3%), pathogenic microorganisms (60.9%), ethical concerns (65.1%), and unpleasant odours

III. METHODOLOGY

Sampling was done at Shirere WWTP, Shikoye stream and river Isiukhu where Shikoye stream receives wastewater discharged from Shirere WWTP. According to the KNBS, (2019) Kakamega municipality has a population of 120,000 people. Local inhabitants are mostly Luhya whose economic activity is farming and fishing. The unit of analysis in the community of the sample area was composed of 84 people in the River Isiukhu catchment area consuming the water for agricultural and domestic use. The points for analysis used in the scientific phase of the study included water spring at S4 and wastewater S1-S3 and S5-S7.

Data was collected using purposive and random sampling techniques. This was followed by a descriptive socio-economic survey to obtain data (age, gender and level of knowledge on pollution) details. As for socio-economic phase, KNBS, (2019) population census indicated that Shirere community area had 800 community members and stakeholders while Kakamega County Water and Sanitation Company (KACWASCO) had seconded 40 workers to WWTP. Following Shen & Fisher, (1999) formular for determining sample size a scale factor of 0.1, that is 10% was applied in sampling both the community members and KACWASCO staff. The maximum sample for the study was 84.

Sample size= 10%* (population size).

Where: 10% (800) =80

10% (40) =4

Table 1

Sampling Strategies

Study unit	Sampling method	Population Size	Sample size
Community members	stratified	800	80
KACWASCO workers	random	40	4

Source; Author, (2021)

3.1 Socio-Economic Data Collection

For socio-economic survey the selected respondents for the study were sampled through stratified random and simple random sampling. The community were stratified based on household requirements provide for each stratum. Members in each stratum were sampled by simple random sampling using lottery method. The slips were named and container mixed. Blindfold selection was done until sample size was achieved.

As shown in table 2, total for two categories of population, the sample size was 84 persons. The following procedure was used in determining the sample size for each population displayed in table 2. Following Shen, & Fisher, (1999) formula for determining representative sample size, a scale factor of 0.1(10%) was applied for both KACWASCO and community. Data collected from KACWASCO shows that there are 40 workers for sewerage at Shirere WWTP and 2019 national census indicated a population of 800 in the Shirere waste water treatment area and Isiukhu catchment. A good maximum sample size is usually 10% of population as long as it doesn't exceed 1000 (Shen, & Fisher, 1999).

Table 2

Study Sample Sizes

Study unit	Population Size	10% Sample
Community members	800	80
KACWASCO workers	40	4
Total	840	84

3.2 Quality Control, Validity and Reliability of Data Collection Instruments

3.2.1 Validity of Data Collection Instruments

Questionnaires

Socio-economic survey data collection tools were taken under same conditions (Sharma et al., 2011). The questionnaire and the interviews were pretested through a pilot study to ascertain their reliability. This pre-test was at the other WWTP at Nabongo. The Pearson coefficient (r) was used to compute the correlation coefficient between the two test scores (Wilson et al., 2011).

3.2.3 Reliability of Data Collection Instruments

The reliability is the stability and consistency with which the instrument measures concept and helps to assess the goodness of a measure (Sekaran, & Bougie, 2010). It also indicates the extent to which it is without bias and hence ensures consistent measurement across time and across various items. For scientific, the experiments of absorbance versus concentration were carried out at Lambda wavelength. The reliability of the phosphate data was used for calibration and ascertained by a plot concentration versus absorbance for standards (Slater et al., 2010). This was done to precede each of the samples analysed. For socio-economic, reliability test was administered by use test-retest method. A code book was prepared and scores of the first test correlated with scores of the second test, and Pearson product moment of correlation was computed using SPSS software version 21.0.

3.3 Data Analysis

According to Montgomery, (2020) ANOVA (Analysis of Variance) serves as a robust statistical tool for analyzing data collected from diverse groups within a community. It enables the researcher to assess the significance of differences in knowledge, attitudes, or perceptions across various demographic or socio-economic groups, (Smith & Johnson, 2019). By applying ANOVA, researcher was able to determine whether differences observed between groups are likely due to actual variations in their perceptions or simply due to chance.

The Shirere WWTP, located in Kakamega county, serves as an ideal case study for employing ANOVA approach. According to Smith, and Johnson, (2019) by systematically measuring and analyzing community knowledge, attitudes, and perceptions using ANOVA, stakeholders can gain a comprehensive understanding of how different factors such as age, education level, proximity to the facility, and socio-economic status impact public opinions. During the study, the analyses of variance was adopted to statistically evaluate the data on knowledge, attitude and perception collected using a questionnaire. According to the results of Alireza et al., (2023) the model was found to be significant as since the significance of each coefficient related to the quadratic equation variables was evaluated by p-value and F-value.

IV. FINDINGS & DISCUSSIONS

Eighty-four questionnaires were set out for the community and KACWASCO workers to ascertain their knowledge, attitude and perception of Shirere WWTP performance.

4.1 Reliability and Validity Tests

4.1.1 Reliability

The consistency of an instrument in measuring what it is supposed to measure was established by first verifying internal consistency and then conducting a pilot study. If the Cronbach's Alpha coefficient is more than 0.70, a questionnaire is considered credible (De Groot *et al.,* 2008). The dependability of the independent variables and the dependent variable was tested using SPSS software version 21, and the findings are displayed in Table 3.

Table 3
Reliability Test

Variable	Cronbach alpha
Water quality risk factors	.769
Waste water effluent quality	.886

The variable under study obtained had Cronbach's Alpha greater than 0.7, indicating that they met the necessary 0.7 for data internal consistency (Mugenda, & Mugenda, 2008).

4.1.2 Validity

The extent to which a measure what it purports to measure is known as data validity (Porter, 2010). Validity is defined by Mugenda & Mugenda, (2008) as the degree to which research findings derived from data analysis accurately reflect the topic under investigation.

Table 4
Test for validity Extraction Method: Principal Component Analysis

Factors	KMO test	Barlett's test of sphericity		
		Chi-Square	df	Sig.
Water quality risk factors	0.799	178.02	1	0.000
Waste water effluent quality	0.893	160.15	1	0.002

As per Table 4, the Kaiser–Meyer–Olkin sampling measure showed a KMO value of larger than 0.5, indicating that the sample size was sufficient to treat the data collected as distributed normally. This was assumed that "item to item correlation matrix based on the replies gathered from respondents for all the effective variables was an identity matrix" was tested using Bartlett's test sphericity. The Bartlett's test was examined using the chi-square test, which revealed that all of the variables were significant at the 5% (0.000) level of significance

4.5.2 Response Rate

Only 82 of the 84 questionnaires provided to the sampled respondents (KACWASCO employees and community members) were filled out and returned in this study.

Table 5

Questionnaire Return Rate

		Frequency	Percent
Valid	Returned	82	97.6
	Not Returned	2	2.4
	Total	84	100.0

As a result, 82 were correctly filled, and these were the only ones utilized in the analysis, resulting in a response rate of 97.6%. as shown in table 5. The high response rate was ascribed to the researcher's use of numerous strategic tactics, according to the report. For instance, the researcher hired a research assistant to handle the distribution and collection of questionnaires while the researcher conducted interviews with the key informants.

4.5.3 Knowledge

The study used the parameters where: 1= Extremely dissatisfied (ED), 2 = Dissatisfied (D), 3 = Neutral (Ne), 4 = Satisfied (S) and 5 = Extremely Satisfied (ES). A summary of the findings is as shown in Table 6 below.

Table 6

Responses on Knowledge of Shirere Community towards Wastewater

	ED (%)	D (%)	N	S (%)	ES (%)	Mean	Std. Dev.	Max	Min
Effluent from Shirere WWTP polluting River Isiukhu	2 (2.4)	10 (12.2)	18 (21.9)	34 (41.6)	18 (21.9)	4.24	1.204	5	1
Poor filtration has led to discharge of effluent pollutant	8 (10.0)	10 (12.2)	22 (26.8)	28 (34.0)	14 (17.0)	4.02	1.059	5	1
There is visual pollution in river and effluent channel stream	10 (12.2)	12 (14.6)	22 (26.8)	29 (35.4)	9 (11.0)	3.91	1.183	5	1
The pitch catchment area is not monitored	8 (9.3)	11 (13.5)	23 (28.0)	29 (35.3)	11 (13.8)	4.14	1.309	5	1
A lot of disease outbreak in the catchment area is due to pollution from effluent	9 (11.1)	9 (10.7)	15 (18.0)	23 (28.4)	26 (31.8)	4.15	1.147	5	1

N=82

From table 6 above, (41.6% + 21.9%), 63% was satisfied that the effluents from Shirere WWTP was polluting river Isiukhu while 42% of the respondents agreed that poor filtration has led to discharge of effluent pollutant. This outcome corroborates well with study done by Gerubin et al., (2022); Scott et al., (2009) who revealed that there is still low knowledge concerning WWTP polluting rivers amongst community members in East Africa. Similarly, 46.4% were satisfied that there is visual pollution in river and effluent channel stream as 26.8 neutral respondents indicated the lack of knowledge on the same. 49.2% were in agreement that the pitch catchment area was not monitored while 28% were indecisive on the same information. This was in line with the study conducted by Michetti et al., (2019) who suggested that gaps in knowledge, and the current restrictions on water reuse patterns is facilitated by acknowledging these aspects. Additionally, 60% of the respondents agreed that a lot of disease outbreak in the catchment area was due to pollution from effluent while 18% were not sure. This concurs with previous study by Kantanoleon et al. (2007), who confirmed that the community's apprehension about the water's safety may be caused by a fear of chemicals (70.3%), pathogenic microorganisms (60.9%), ethical concerns (65.1%), and unpleasant odours.

Table 7

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.510[a]	.429	.827	1.70112

From the study findings in Table 7, the value of R-square was 0.429. This implies that, 42.9% of variation of wastewater treatment was explained by negative knowledge of the residents. This implies that 57.8% of the members in the community lack adequate knowledge in matters wastewater treatment processes. The outcome agrees with Scott et al. (2009) who revealed that inadequate knowledge of the community's safety could lead to wastewater treatment facility failures globally.

Table 8
Analysis of Variance Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1149.030	1	1149.030	397.067	.002[b]
	Residual	237.291	81	2.894		
	Total	1386.321	82			

a. Dependent Variable: waste water treatment, b. Predictors: (Constant), knowledge of the residents.

Montgomery (2020) revealed that ANOVA test serves as a robust statistical tool for analyzing data collected from diverse groups within a community or locality. From the findings in Table 8 above, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely; knowledge of the residents is important in predicting of wastewater treatment as indicated by significance value=0.002 which is less than 0.05 level of significance ($p=0.002 < 0.05$). This concurs with the results of Alireza et al., (2023) whose model was found to be significant since the significance of each coefficient related to the quadratic equation variables was evaluated by p-value and F-value.

Table 9
Coefficients Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.476	.712		6.285	.000
	Perception of the residents	.510	.026	.910	19.927	.002

a. Dependent Variable: wastewater treatment

From Table 5 to 9 the study findings revealed that knowledge of the residents had significant influence on Shirere Wastewater Treatment Plant in Kakamega County. In table 9 the statistics output was t-statistic=19.927, p-value=0.002< 0.05. These results confirmed that at a 5% level of significance the community knowledge had statistical significance. Thus, for every unit increase in knowledge of the residents in Shirere there was a corresponding increase on wastewater treatment by 0.510.

4.5.4 Attitude and Perception

The study used the parameters where: 1= Strongly Disagree (SD), 2 = Disagree (D), 3=Neutral (Ne), 4 = Agree (A) and 5= Strongly Agree (SA). A summary of the findings is as shown in Table 10.

Table 10
Responses on Attitude and Perception

	SD (%)	D (%)	Ne (%)	A (%)	SA (%)	Mean	Std. Dev.	Max	Min
River Isiukhu is of benefit to all	2 (2.1)	10 (12.31)	18 (21.8)	34 (41.9)	18 (22.1)	4.24	1.204	5	1
River Isiukhu is polluted by Shirere WWTP	8 (10.0)	11 (12.8)	22 (26.6)	28 (33.9)	13 (16.6)	4.02	1.059	5	1
Fish from River Isiukhu is fit for consumption	10 (11.8)	10 (12.5)	22 (26.6)	29 (35.6)	11 (13.5)	3.91	1.183	5	1
Pollution is the cause for diseases	8 (9.3)	11 (13.5)	23 (28.0)	29 (35.3)	11 (13.8)	4.14	1.309	5	1
Water from Shikoye Stream around Shirere WWTP is fit for consumption	9 (11.1)	9 (10.7)	15 (18.0)	23 (28.4)	26 (31.8)	4.15	1.147	5	1

N=82

The outcomes in table 10 reflected the responses on the community attitude as well as perception. Around 63 percent of the respondents had a positive feeling that River Isiukhu was beneficial to all community members while 37 percent were neutral and dissatisfied whether the community members fully benefited from River Isiukhu. On the same note 50.3 % of the respondents strongly agreed that River Isiukhu was polluted by Shirere WWTP and 49.7% suggested otherwise. The findings correspond with Kantanoleon et al. (2007); Khanpae et al., (2020); Robinson et al., (2005), whose respondents expressed benefits for comparable irrigation techniques.

Additionally, 49.1% confirmed that Fish from River Isiukhu was fit for consumption while 50.9% felt that the fish was not fit for human consumption. 49.1% of the respondents concurred that pollution is the cause of diseases among community members living around river Isiukhu whereas 50.9% thought otherwise. The findings also revealed that 49.2% of the respondents perceived that pollution was the cause of the disease while 28% were undecisive as 22.8% disagreed. This corroborates well with Okari, (2019) who found out that illness outbreaks among community members in urban areas are due to ineffective sewerage infrastructure.

Water from Shikoye Stream around Shirere WWTP is fit for consumption as agreed by 60.2% from the outcome. This was a similar observation addressed by Kimongu & Obiri (2012), who suggested that assuring the safety of drinking water is necessary and can be achieved through attitudes, and perceptions of the community members. Therefore, the general public knowledge, attitudes, and perceptions (KAPs) about a project's purpose, advantages, and implementation outcomes are the only factors that determine whether the community members would adopt and use it, (Saad et al. 2017).

Table 11
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.226[a]	.045	.040	2.675

From findings in Table 11, the value of R-Square is 0.045. This implies that, 4.5% of variation of Wastewater Treatment Plant in Shirere was explained by attitude and perception of the residents within the area. Therefore, the outcome revealed that attitude and perception have significant effect on wastewater treatment in Shirere at 5% level.

Table 12
Analysis of Variance (ANOVA) Test

Model		Sum of Squares	D.f	Mean Square	F	Sig.
1	Regression	1232.942	1	1232.942	659.160	.045[b]
	Residual	153.379	81	1.870		
	Total	1386.321	82			

a. Predictors: (Constant), attitude
b. Dependent Variable: wastewater treatment

According to Smith, & Johnson, (2019) community knowledge, attitudes, and perceptions can be measured and analyzed strategically, using ANOVA. From the findings in table 12, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely; attitude and perceptions of the residents in Shirere, is important in predicting of wastewater management in Shirere as indicated by significance value=0.045 which is less than 0.05 level of significance ($p=0.045<0.05$).

Table 13
Coefficients for the Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.406	.557		7.913	.567
	Attitude	.628	.024	.943	25.674	.045

Dependent Variable: Wastewater treatment

The Pearson coefficient (r) is relevant in computing the correlation coefficient between the two test scores (Wilson *et al.,* 2011). From Table 13, the study revealed that attitude and perception of the residents in Shirere had a significant influence on wastewater treatment at Shirere in Kakamega County (t-statistic = 25.674, p-value = 0.045 < 0.05). Hence, for every unit increase in attitude and perception of the residents there was a corresponding increase in waste water treatment at Shirere in Kakamega County by 0.628. Therefore, at 5% level of significance, attitude and perception had a positive influence on waste water treatment at Shirere in Kakamega County.

V. CONCLUSION & RECOMMENDATION

5.1 Conclusions

The level of knowledge of the community around Shirere Wastewater Treatment Plant has no bearing on the effluent pollution into River Isiukhu. Conclusively, an evaluation of the community members from the social investigation data showed negative attitude due to the pollution exhibited by the Shirere WWTP. From the findings in table 13, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely; attitude of the residents in Shirere, is important in predicting of wastewater management in Shirere as indicated by significance value=0.045 which is less than 0.05 level of significance ($p = 0.045 < 0.05$). From results, the study revealed that attitude of the residents in Shirere had a significant influence on wastewater treatment at Shirere in Kakamega County (t-statistic=25.674, p-value=0.045< 0.05). Therefore, at 5% level of significance, indicating that community knowledge, perception and attitude had a positive influence on waste water treatment at Shirere in Kakamega County. Likewise, for every unit increase in attitude of the residents there was a corresponding increase in wastewater treatment at Shirere in Kakamega County by 0.628.

5.2 Recommendations

From the study outcomes, it was recommended that, the level of knowledge of the community around Shirere Wastewater Treatment Plant with regards to pollution of river Isiukhu by the pollutants under this study was low. Therefore, there is need for the community sensitization within river Isiukhu catchment area. This is to increase more pollution awareness and development of community best mitigation measures

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