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Influence of Environmental Factors on Public Perception Towards Sewerage Treatment Plants in Meru County, Kenya

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ABSTRACT

Effective wastewater management is among the Sustainable Development Goal 6.2 targets as it ensures proper disposal of wastewater, nature conservation, and promotion of health. Although Government efforts in supporting establishment of waste water treatment plants have been shown, the projects are at times rejected by the community leading to wastage of resources, unsolved sewage disposal problems, and the spread of diseases emanating from poor sewage management. This study examined the influence of environmental factors on public perception toward sewerage treatment plants in Meru County, Kenya, whose solutions have often been facing rejection from the communities. The study targeted residents around Rwanyange, Gakoromone and Maua sewerage treatment plants in Meru County, Kenya. Mixed methods approach was used with a convergent study design. A sample of 386 household heads was targeted. Cluster and simple random sampling techniques were used for selection of the areas and household heads respectively. Quantitative data was collected from households using structured questionnaires and analysed in descriptive statistics and in logistic regression using the Statistical Package for Social Sciences (SPSS) version 26. Logistic regressions were carried out in univariable and multivariable tests to show the relationship between dependent and independent variables and findings presented as odds ratio with 95% Confidence Intervals (CI). Qualitative data was obtained from focus group discussions, analysed based on themes and presented in narratives. Overall, the public perception towards sewerage treatment plants was negative. Perception varied with age with people aged > 50 years being 2.78 times more likely to exhibit positive perception towards the treatment plants compared to those aged 18-28 years ($P<0.05$). Participants especially those who resided very near the treatment plants were concerned of the odour that resulted from the treatment plants and the impacts of the plants on soil contamination (adjusted OR=0.75, 95% CI: 0.86-3.06, $P<0.001$). Public notion on the possibility of the treatment plants to result in underground seepage and concerns on the quality of air due to pollution significantly lowered perception by 52% and 60% respectively ($P<0.05$). The study concluded that public perception towards the treatment plants was affected by participants' concerns on their impact on the environment. The study recommends community involvement in all implementation stages of sanitation projects for increased acceptance, ownership and trust of solutions by beneficiaries. There is also need for policies that substantiate environmental awareness for sustainable solutions. A transparent process of conducting Environmental Impact Assessment of sanitation solutions in the early stages of implementation could be key in mitigating environmental issues that could likely arise as a result of establishment of the sanitation solutions.

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Introduction

Effective wastewater management is one of the targets envisioned in the Sustainable Development Goals by 2030 (United Nations, 2015) for safe disposal of human waste, nature conservation, and promotion of health. However, in a global scale, almost 50% of the waste water generated is released unsafely treated to the environment (WHO/UNICEF, 2022) hence a critical public health and environmental issue. Unsafe management of faecaly contaminated waste water could attract significant health risks such as diarrheal infections which are among the leading causes of children deaths (Demissie et al., 2021). Safe faecal management remain a substantial concern particularly in developing countries due to limited infrastructure and resources for establishment of viable solutions (Oberg et al., 2020) which has been associated with inadequate sanitation facilities, the practice of open defecation and consequently contamination of water sources perpetuating spread of water borne diseases. While some developed countries like America and Europe demonstrate a commendable progress of up to over 90% safe sanitation coverage, others like Sub-Saharan African countries, Kenya included, lag behind with less than half having access to safe faecal management options (WHO/UNICEF, 2022). Achieving universal safe management of faeces in waste water is a challenge which require efforts of ensuring equitable access to proper sanitation services through support and enhancement of viable sanitation infrastructure.

To ensure attainment of the Sustainable Development target, a range of sanitation options including on-site treatment systems (where waste water is handled at the point of collection) and conventional systems (sewerage systems conveying waste far from the point of collection) have been thought as viable solutions (WHO 2020; *Estévez et al*., 2022). Although onsite sanitation solutions are economically viable (Oberg et al., 2020), constraints in space and operation mechanism especially in overpopulated areas could be a hindrance in effective management of waste water (Chunga et al., 2016). As people migrate to urban areas and as towns grow, the need for sanitation options that can ensure universal coverage cannot be ignored. Although Governments have shown efforts in supporting establishment of sustainable waste water treatment plants, their implementation and utilization success is not always guaranteed (Fu et al., 2022). The projects could at times be negatively perceived and rejected by the community leading to wastage of resources, unsolved sewage disposal problems, and the spread of diseases emanating from poor sewage management.

The manner in which communities perceive waste water treatment plants could be deeply rooted to their concerns regarding the impact of treatment plants on the environment. Comprehending the issues could be essential for sustainable developments in the waste water management field. Issues surrounding perception of the community on sewerage sanitation projects have received a lot of concern in the literature. In China, a study by Fu et al. (2022) found out that establishment and performance of wastewater treatment plants was constantly hindered by residents' negative stereotypes. Residents rejected waste water treatment plants due to the perception that they could discard disgusting, dangerous, and harmful water into their backyards. Although support for the establishment of waste water treatment plants may be offered, they may exhibit varying degrees of success and reactions if the perceived threats for the project by the community outweigh the ideal benefits.

The need for ownership and acceptance of sewerage projects underscore the criticality of community participation at every stage of the project implementation (Munene, 2020). As per Munene (2020) community involvement builds a sense of full control over projects by the community. In Ethiopia, Manyazewal and Walelgn (2019) established that satisfaction with sanitation services by residents increased up to 80% due to high institutional engagement of the community in waste management. However, in China, limited community involvement saw establishment of waste water treatment plants in undesirable areas like near rivers and residential areas which was a potential source of environmental and water contamination (*Hu et al*., 2015). While the National Environment Management Authority (NEMA) is legally mandated to coordinate and supervise the Environmental and Social Impact Assessment (ESIA) for development projects (GoK-EMCA 2022), their approach is majorly expert-centered and at times overlook active community engagement in their processes. Failure to engage the community during the implementation of sanitation projects

could spearhead their rejection resulting in overloaded sanitation infrastructure.

Sanitation infrastructure requires maintenance or expansion for continued operation and service to residents. However, efforts to ensure operation, maintenance or construction of waste water management projects do not always bear the expected outcomes possibly due to varying perceptions of the recipient or benefiting communities. Although faecal sludge management options are limited in Meru County (Munene, 2016), and that solutions to enhance safe human faecal management such as expansion of sewerage plants have been put in place, urban populations thrive in contaminated areas, even in the presence of novel sanitation solutions due to community rejection and objection over the projects (Munene, 2016; Takouleu, 2020). Studies by Hossain (2016) and Fu et al. (2022) have hinted that community concerns on environmental factors could impact success of implementation of sanitation projects. However, the studies show limited information on a local scale, on perceived risks and benefits in the expansion of wastewater treatment plants and discrepancies in the level of satisfaction with sewerage treatment plants. Few studies have therefore focused on environmental factors in relation to perception of sanitation projects. Limited understanding on the influence of environmental factors on perception of the community towards waste water treatment plants could result in over-expenditure and government investment in resources on projects which end up unaccepted and unused. Failure to accept the establishment of sanitation solutions could attract unsafe ways of faecally contaminated waste water management which could expose the population to unending sanitation-related morbidities and mortalities. This study particularly focused on specific factors on environmental aspects and their influence on community perception on the waste water treatment plants.

Objective

To investigate the influence of environmental factors on public perception towards sewerage projects in Meru County

Methodology

The methods of data collection and analysis were as discussed in the following sub-topics:

Study design

A convergent design and a mixed methods approach was used in data collection. The design was suitable as it ensured simultaneous collection and analysis of both qualitative and quantitative data.

Study site

The study was conducted in Meru County Kenya. It is predominantly inhabited by the Meru tribe. Parts of the area are served by the conventional wastewater treatment plants which get overutilized due to the increasing waste generation from the growing population in the County (Munene, 2020).

Target population

The study targeted the communities around Rwanyange area in Meru town, Maua and Gakoromone where waste water treatment plants were located. According to KNBS (2019) the total number of households in the study areas is 10, 752 with 1260 for Rwanyange, 6459 for Maua and 3033 for Gakoromone. Household heads from the study areas were targeted for participation in household surveys. The study also engaged focus group discussion participants who included community local leaders, Public Health and Community Health Officers, and implementers of the sanitation projects as they were believed to have a comprehensive information concerning the communities in the study areas.

Sample size determination and sampling techniques

The study targeted a sample of 386 participants calculated using Yamane's (1967) formula as

$$n = \frac{N}{1 + Ne^2} = \frac{10,752}{1 + 10,752\ (0.05^2)} = 386$$

Where N was total households and e=margin of error

Cluster sampling technique was used to classify the area into three clusters representing the areas covered by the waste water treatment plants namely: Rwanyange, Gakoromone and Maua. Participants for the quantitative study at the household level, who were household heads were sampled using proportionate-to-size simple random sampling techniques from each cluster.

Study area	Population	Number of Households	Sample per cluster
Gakoromone	8379	3033	109
Rwanyange	4471	1260	45
Maua	19760	6459	232
Total	**32610**	**10752**	**386**

Table 1: *Sample distribution per cluster*

Source: *KNBS (2019)*

The number of participants per cluster was calculated by dividing the product of households per cluster and the desired sample size by the total number of households targeted as shown in *Table 1*.

Participants engaged for the Focus Group Discussions were selected using purposive sampling technique because they were likely to have the desired knowledge on the sewerage treatment matters.

Data Collection and Analysis

Quantitative data was obtained from the household heads in the study area using structured questionnaires. The data was analysed using the Statistical Package for Social Sciences (SPSS) version 26 to yield descriptive and inferential statistics. Descriptive analysis generated data in percentages, frequencies and mean while inferential analysis was done in logistic regression to generate both univariable and multivariable results. For univariable analysis, the association between public perception on sewerage treatment plants and each covariate was done in turn and the findings presented in adjusted odds at a confidence interval of 95%. Further, multivariable analysis on the covariates which turned significant in the univariable model was done. The analysis involved a step-by-step elimination of the covariates until all the remaining covariates in the multivariable analysis were statistically significant. The results were presented as unadjusted odds at 95% confidence interval. For qualitative data, participants were selected from each cluster for participation in separate Focus Group Discussions based on the cluster.

Ethical considerations

Ethical approval was sought from the National Commission for Science, Technology and Innovation (NACOSTI). Permission to collect data in the communities was granted by relevant authorities in the County and the study areas. Participation in the study was on voluntary basis and those who were engaged for participation gave verbal consent to ascertain their willingness to take part in the exercise. For confidentiality of the information gathered, the data was stored in a private lockable box to avoid access by any third party. Besides, participant's names were not captured in the data collection instruments to ensure privacy of the responses.

Results and Discussions

The findings obtained from the study were as discussed.

Response rate

A return rate of 72% (274 questionnaires) was attained which was adequate for analysis (Mugenda & Mugenda, 2003). One hundred percent (100%) return rate was not achieved due to non-response and return of partially filled questionnaires which were ignored during analysis.

Demographic Information

More females (55.1%) compared to males (44.9%) took part in the study. The predominance of female participants was associated with differences in gender roles. According to a study by Strambo et al. (2021), women could be more concerned of sewerage treatment plants outcomes due to their possible negative impacts in relation to their hygiene. Only 6.9% of the respondents had no formal education signifying that majority of participants understood the importance of safe management of human

faeces in relation to prevention of sanitation-related diseases. Regarding occupation, most respondents (42.3%) were self-employed and performed activities like crop farming, livestock keeping and small-scale businesses and 35% were not employed at all. The fact that income from most self-employment opportunities may not be reliable and that a significant number of people lacked a source of income suggested the residents could possibly struggle to attain safe sanitation if support in provision of sanitation solutions was not offered.

Public perception on sewerage treatment plants

Respondents were given several statements surrounding benefits and willingness to use waste water treated from the sewerage plants to find out whether the treatment plants were acceptable to the residents as shown in *Table 2*.

When requested to compare the benefits of the treatment plants with limitations, many (60.2%) respondents supported the statement while 39.8% of the respondents were of the negative opinion. The findings suggested that residents mostly appreciated the importance of the sewerage treatment plants because they would purify contaminated water before it was released to the environment and would protect aquatic life since water released could be less polluted as reported in the focus group discussion where participants said:

> *"In the absence of these water treatment technologies, we could be interacting with very dirty water containing traces of human faeces in our environment."*

> *"Release of the water to rivers or water ponds containing fish is likely to make them die. At least water that finds its way to water bodies is safe for aquatic life."*

Although most residents embraced the role of waste water treatment plants in treating waste water, more than a third of the population deemed the waste water treatment plants as non-beneficial. There could have been a lack of understanding about the complexities associated with the processes of waste water treatment making respondents to primarily focus on the visible aspects such as visual pollution or odour which could have created a negative perception towards the treatment plants. Instances of malfunction in the treatment plants could receive high media coverage, amplifying concerns which highlight the negative aspects rather than the benefits of treatment plants. The findings were explained in the focus group discussion where a respondent argued that:

> *"Last year everybody saw in the news that some people were demonstrating against the treatment plant located in Rwanyange. Due to its association with the possibility of promoting environmental or land pollution, most of these communities have fear that it would affect their lives. You know they move by what they hear."*

On one side, these drawbacks could have been overshadowed by the benefits which made community members to prioritize the positive aspects of the plants in their assessments and perceptions. On the other hand, the limitations could have blocked out the benefits and made some residents view the treatment plants with a negative mentality. Similar findings were obtained by *Msaki et al.* (2022) in Tanzania where participants had mixed feelings regarding the benefits of waste water treatment plants. In Jordan, a study by Tarawneh et al. (2024) established that participants were willing to accept waste water re-use, provided that experts had ascertained its safety which suggested that residents understood the benefits associated with waste water treatment plants.

Results showed that 58% of the members demonstrated non-acceptance of the treatment plants which implied that the treatment plants were unacceptable to a high number of residents. The findings concurred with the results from a study by Faria and Naval (2022) who established low acceptance rate of sanitation projects from the public as a result of the perception on inefficiencies of the plants to treat waste water.

From the findings, 37.2% deemed the treatment plants as potential sources of diseases. The perception of sewerage treatment plants as sources or non-sources of sanitation-related diseases could vary based on several factors such as access to accurate information regarding the treatment plants as confirmed in a study by Mela et al. (2022) in Greece. People who understood the role of sewerage plants in preventing diseases and who had an historical experience on the conditions prior to establishment of treatment plants were likely to respond positively as supported in the Focus Group Discussion where a participant said:

"People who knew how it was before and the positive change now cannot complain about the treatment plants not

Statement	True	False	Total
Treatment plant has more benefits than limitations	165(60.2%)	109(39.8%)	274(100%)
Sewerage plant is acceptable to community members	115(42.0%)	159(58.0%)	274(100%)
Treatment plant expose community to diseases	102(37.2%)	172(62.8%)	274(100%)
Community attitude towards the plant is positive	109(39.8%)	165(60.2%)	274(100%)
Treatment plants are effective in addressing community waste water management needs	115(42.0%)	159(58%)	274(100%)

Table 2

preventing us from exposure to diseases. Human faecal matter which used to be found all over can now be treated in the plants."

Overall, many participants (60.2%) rated community attitude towards the waste water treatment plants as negative. The findings suggested that the community's attitude towards the treatment plants was triggered by the community's take that waste water from the treatment plants was inefficiently treated and that it would contaminate the environment. Residents might have worried about the release of untreated or partially treated waste water to ecosystems which caused communities' distrust on the sewerage treatment plants. Similar findings were reported in a study by Fu et al. (2022) in China. For waste water to be safe, quality parameters should be within the standard permissible limits by WHO (2022) such as low faecal coliforms, near neutral PH, low Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) and low quantities of Total Dissolved Solids.

Most of the participants (58%) deemed the treatment plants as ineffective in addressing the community's needs regarding waste water management. The findings could be explained by the fact that a portion of the respondents were not served by piped networks leading to the sewerage treatment plants. In addition, some of the treatment plants were outdated and overloaded, which resulted in sub-standard treatment processes. It was indicated in the Focus Group Discussion that one of the treatment plants (Gakoromone) was overloaded hence ineffective in handling the waste from the community. A Focus Group Discussion participant said that:

"Some pipe networks leading to Gakoromone, the old sewerage treatment plant, were faulty and sometimes leaked to walkways along the road. The treatment plant is also overloaded and cannot treat the high amount of waste generated in this area."

A study conducted by Fu et al. (2022) in China also reported inefficiencies of treatment plants in handling waste from a large population. When poorly treated water is released to the environment, soil pollution as well as water contamination could occur, and could be a health risk to communities and could contribute to sanitation-related diseases such as diarrhea.

Overall, 64.2% of the community members who participated in the study showed a lack of satisfaction with the treatment plants. The community's dissatisfaction could have been caused by the communities' perception on the impacts of the plants to their lives and their agricultural lands. In China, a study by Fu et al. (2022) reported residents' negative perception towards treatment plants because they were thought to be contaminants of backyards and the environment.

Environmental factors and public perception towards sewerage treatment plants

Results in *Table 3* show that 78.8% of participants thought that the treatment plants had ability to cause changes in the quality of water or soil in the areas surrounding the plants. The processes of waste water treatment such as aeration, filtration or disinfection could have resulted in emission of odours especially when the plants were poorly maintained or uncontrolled, which might have attracted the negative perception on the plant's impacts on the air quality. In addition, the process of transport-

ing sewage to the treatment plants could have been thought to facilitate air pollution due to spillage and the bad smell of human waste. Moreover, the efficiency of treatment of waste water from the plants could have been doubted or questionable, which might have made participants think that trace quantities of pollutants such as heavy metals could find their way to water bodies which could cause water pollution.

It was revealed in the Focus Group Discussion conducted in the area that public perception of the sewerage treatment plants negatively affecting water, soil or air quality arose from concerns on the management of byproducts, partial removal of contaminants as well as pollution emissions. Focus Group Discussion participants said:

"Treatment plants especially those constructed in local areas are not that effective in handling the waste directed to them. Try the water generated from the plants on farming. It will contaminate your agricultural land."

"See, you can't tell whether the treatment plants will be treating water as expected. The release of this water may bring water-related diseases because it will sometimes find its way to water sources. Kathita River is just around."

Residents were concerned about the contribution of sewerage treatment plants to the quality of air, soil and water, which influenced their perception towards the treatment plants. Similar findings were reported in a study by Fu et al. (2022) in China where residents' rejection of treatment plants was as a result of the perception that they would release harmful and disgusting water to the environment and backyards.

Majority of the participants (85%) indicated that public perception towards the sewerage treatment plants could be influenced by smell of air from the plants (Table 3). Odours emitted from sewerage treatment plants could have evoked negative associations or discomforts probably for residents who resided near the treatment plants or who regularly visited the plants. Smell to them might have been a prominent issue that shaped public opinion which possibly led to concerns on the smell from the sewerage plants.

When asked to give their take on possibility of underground seepage from the treatment plants and its ability to cause water borne-diseases, the opinion for 71.5% of the respondents was 'true' while 28.5% selected the 'false' option. Overall, the results suggested that the community held perceptions that treatment plants would contaminate underground water which could consequently lead to spread of water borne diseases. Residents showed concerns of the potential breaches or possibility of leaks from the sewerage infrastructure into ground water which facilitated fears of the contamination reaching the underground water sources as reported by Focus Group Discussion participants that:

"Wait until it rains a lot, some of these lagoons will be filled with water, I believe sometimes they even leak contaminated water to the underground water. It is important to be keen on the design and maintenance of their floors."

"Sometimes we talk of drying beds. Where does the remaining water in sludge drain to? Is it not going down the earth?"

The results implied that perception of residents towards the treatment plants could be influenced by the feeling that they endangered underground water sources.

At a mean of 3.08 (SD=1.19), participants believed that the plants were potential sources of environmental harm. The results were explained in the Focus Group Discussion where a participant associated the waste water treatment plants with ability to contaminate their surroundings with faecal matter as follows:

"If you look at the water that pass through the drains and is directed to the sewerage treatment plants you can tell that there are traces of human faeces. It is always blackish. They sometimes block because of the huge clothes and stones thrown in them. This water comes to our environment. It is the one which contaminates even household surroundings. You cannot leave your children to play around with the household soil because they will eat it and suffer from diarrhea."

Another participant in the Focus Group Discussion showed concern on the location of the sewerage treatment plants away from the community dwellings to minimize interaction with odour that was perceived to emanate from the plants. The participant said:

"Sewerage treatment plants should be located in abandoned places where people don't live due to the bad odour likely to come from the treatment plants. We are not sure of the measures that the County Government will take to ensure that sewage is fully treated so that what is released does not harm our environment."

Contamination of surroundings with faecal mat-

Response	Frequency	Percentage
Changes in the quality of water or soil in the area surrounding the sewer plant		
Yes	216	78.8
No	32	11.7
I have never been to the plant	26	9.5
Total	**274**	**100.0**
Changes in the quality of water or soil in the area surrounding the sewer plant		
Yes	233	85.0
No	41	15.0
Total	**274**	**100.0**
Sewerage plants cause seepage into underground water which can cause disease		
True	196	71.5
False	78	28.5
Total	**274**	**100**
Sewerage plants harm environment		
Mean	3.08	
Standard deviation	1.19	

Table 3: *Perception on impact of treatment plants on environment*

ter could position the community members at a risk of acquiring sanitation-related diseases such as diarrhoea. The results meant that residents in the study area deemed the waste water treatment plants as having the potential to negatively interfere with the environment and livelihood, which affected their perception towards the plants.

Regression analysis of the influence of environmental factors on public perception towards

Logistic regression analysis was done to assess the influence of environmental factors on public perception towards sewerage treatment plants and the results were as shown in *Table 4*. The omitted variable for instance on age and gender was considered as the reference variable hence not included in the table.

The perception proved more positive with increasing age of respondents. The probability of community members aged above 50 years of having positive perception was 3.19 times higher than residents in the reference category (18-28 years) (unadjusted OR=3.19, 95% CI:0.26-4.99; P=<0.001). As well, people aged 40-50 years and 29-39 years were 3.04 and 2.98 times more likely to exhibit positive perception towards the treatment plant compared to people from the reference category respectively (unadjusted OR=3.04, 95% CI: 0.18-5.02; P=0.012; unadjusted OR=2.98, 95% CI: 1.19-7.52; P=0.020). Being a female was associated with 3.04 higher odds of having positive perception towards the treatment plants although the relationship was non-significant (P>0.05). Results for the adjusted (multivariable) model showed that the lower the age of residents, the more the negativity towards the treatment plants as young people were influenced by external forces to reject the treatment plants.

Findings from the univariable analysis for the odds of public perception on sewerage treatment plants shown in Table 4.28 showed a significant negative relationship between association of plants with impact on the environment (unadjusted OR=0.69, 95% CI: 1.38-9.53, P=0.009<0.05), public notion on possibility of the plants to cause underground seepage (unadjusted OR=0.44, 95% CI: 0.13-4.42, P=0.000<0.05) and concerns on air quality (unadjusted OR=0.32, 95% CI: 0.13-0.78, P=0.013).

From the results in the multivariable analysis, the odds of public perception with regard to the plants' impact on the environment, public notion on possibility of underground seepage and concerns on air quality were also negative and statistically significant (adjusted OR=0.75, 95% CI: 0.86-3.08, P=0.041; adjusted OR=0.48, 95% CI: 0.54-4.30, P=0.000; adjusted OR=0.40, 95% CI: 0.21-0.93, P<0.001 respectively).

The findings suggested that the odds of public perception towards sewerage treatment plants was 25% lower when residents deemed the plants as sources of environmental pollution than when they did not. Additionally, the odds were 52% low-

Variable	Perception of sewerage treatment plants					
	Unadjusted ORs (95% CI)	P-value	Adjusted ORs (95% CI)	P-value	S.E	Constant (β_0)
Age						
29-39	2.98 (1.19-7.52)	0.020	1.47 (0.62-6.10)	0.000	0.47	1.09
40-50	3.04 (0.18-5.02)	0.012	2.06 (0.65-5.01)	0.020	0.43	1.19
>50	3.19 (0.26-4.99)	<0.001	2.76 (0.44-3.18)	0.000	1.65	1.37
Gender:						
Female	3.63 (0.31-1.54)	0.003	3.04 (0.14-2.88)	0.120	1.41	0.54
Impact on environment(soil)	0.69 (1.38-9.53)	0.009	0.75 (0.86-3.08)	0.041	1.43	1.29
Underground seepage	0.44 (0.13-4.42)	0.000	0.48 (0.54-4.30)	0.000	0.62	0.27
Air quality	0.32 (0.13-0.78)	0.013	0.40 (0.21-0.93)	<0.001	1.46	0.15

Table 4: *Odds of perception of sewerage treatment plants in Meru (n=274)*

er when residents associated the plants with ability to cause underground seepage compared to when they did not and by 60% when residents had feelings that the treatment plants affected air quality. Overall, the implication of the findings was that concerns regarding the influence of the treatment plants to the environment made residents to be against the treatment plants. The fact that people do not often like living in a contaminated environment due to fear of contracting diseases which can possibly emanate from such an environment might have facilitated the negative reactions.

Conclusion

The study concluded that public perception towards the treatment plants was generally negative. Provision of suitable sanitation solutions require an understanding on the dynamics of the communities and contexts in which they are established. Sewerage treatment plants may be supported or rejected based on the perception of the public. Negative perception has the possibility of blocking planned investments from moving ahead. Positive perception among communities, which attract acceptance to solutions provided, is a key element in promoting the success of waste water treatment plants.

Concerns regarding the impacts of the treatment plants on soil, underground water and air quality highly attracted negative perception towards the treatment plants. A transparent process of conducting Environmental Impact Assessment of sanitation solutions in the early stages of implementation could be key in mitigating environmental issues that could likely arise as a result of establishment of the sanitation solutions.

Recommendation

The study recommends the need for concerted efforts by sanitation implementers in provision of public education on the essence of sewerage treatment plants in their initial stages of implementation for increased acceptability and a positive perception towards the treatment plants. A two-sided contribution during establishment of sewerage treatment plants, of project implementers and the community, is needed for sanitation projects to foster trust and transparency to the benefiting residents. Embracing the views of community members and addressing needs per their desires other than the way implementers desire could be more practical in addressing community matters so that the community suggestions can be based on solutions which can best suit their needs.

There is need for policies that substantiate environmental awareness to promote more sustainable sanitation solutions. In addition, the County ministries of Water and Sanitation should target frequent inspections to ensure maintenance and proper functioning of the treatment plants for increased treatment efficiency and reduced environmental concerns.

Competing Interests

The authors declare that there are no competing

interests

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