

Assessment of Variables Affecting Water and Sanitation at the Federal Government Low-Cost Housing Estate, Akure

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Abstract

This study aimed at determining the association between water, sanitation and hygiene with some socioeconomic variables at the Federal Government Low-cost Housing Estate, Akure, Nigeria. Data were collected from respondents residing in 194 clustered buildings. Findings revealed that the association between the type of sanitation facility available and water sources was significant ($X^2 = 57.62$, $df = 9$, $p < 0.01$). Secondly, the association between income and water sources of the respondents was significant at less than 0.01 ($X^2 = 10.77$, $df = 6$, $p > 0.05$). Also, the association between gender and toilet facilities was not significant at less than 0.05 alpha level ($X^2 = 9.62$, $df = 3$, $p > 0.05$). Besides, gender and water sources were significant at less than 0.01. In addition, the association between water collectors and water sources was significant at less than 0.01. Lastly, the distance of water to the residents and the litres of water available was significant at less than 0.01 alpha level, ($X^2 = 23.54$, $df = 8$, $p < 0.01$). It is recommended that community water and sanitation facilities should be encouraged. This will facilitate equitable distribution, the proper and adequate maintenance of these facilities.

Keywords: Sanitation, Housing Estate, Water, Sanitation, Akure.

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1.0 Introduction

Basic sanitation has been identified as the low-cost technology, ensuring hygienic excreta disposal and a clean and healthy living environment at home and in the neighbourhood of users. Access to an improved water source on the other hand, refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source (Koskei *et al.*, 2013). Improved sanitation includes facilities such as public sewer connection; septic system connection; pour-flush latrine; simple pit latrine; ventilated improved pit latrine and private facilities (World Bank, 2013) as cited in Koskei *et al.*, (2013). In the same vein, example of improved water sources includes household connections, public standpipe, borehole, protected well or spring and rainwater collection (World Bank, 2013). A safe, reliable, affordable and easily accessible water supply is important for good health. For several decades, about a billion people in developing countries do not have access to a safe and sustainable water supply, for personal hygiene, food hygiene, domestic cleaning, and laundry services (Bain, R., Wrigh, J., Christenson, E. and Bartram, 2015) (Bain, Wrigh, Christenson, & Bartram, 2015). It was estimated that at least 50 litres of water per person per day is needed and about 1,000 cubic metres of water is needed per year per person, while inadequate water supply can hinder good sanitation and hygiene (Paul, Alan and Richard, 2010).

The World Health Organization [WHO], in 2017, reported that 71 per cent of the world population (5.4 billion people) used a safely managed drinking water service; that is located in their premises. Paradoxically, 844 million people still lacked even a basic drinking water service, 263 million people spent over 30 minute round trip to collect water from an improved source. Besides, 159 million people still collect drinking water directly from surface water sources. Absurdly, 58% of these people lived in sub-Saharan Africa. Inadequacies in water supply affect health adversely both directly and indirectly, while unsafe drinking water contributes to more than 25million cases of typhoid and paratyphoid. Estimates show that 250,000 people die annually from these diseases, whereas diseases like cholera, poliomyelitis and hepatitis had been linked to inadequate water supply (Ogunmokon, 2015).

Water is life and sanitation is dignity, therefore, where water is scarce, choice of safe sanitation will be adversely limited to unsafe sources. Sanitation as posited by (Colette Gènevaux, 2018)(Colette Gènevaux, 2018), is the provision of facilities and services for safe management and disposal of human urine and faeces (Colette, 2018). The WHO, in (2017) reported that 39 per cent of the global population (2.9 billion people) used a safely managed sanitation service, while 27 per cent of them (1.9 billion people) used private sanitation facilities connected to sewers from which wastewater was treated. In the same vein, 13 per cent of the global population (900 million people) used toilets or latrines, where excreta was disposed of in situ. Regrettably, 2.3 billion people

still lacked even a basic sanitation service, 600 million people used an improved facilities shared with other households, 10 million people worldwide still practised open defecation. WHO, (2011) reported that poor sanitation can lead to the spread of disease that leads to infant mortality. Diarrhoea from bad water accounts for more than 2.5 million deaths annually. The epidemiology report indicated that 150,000 to 200,000 Nigeria children die from Diarrhoea (UNICEF and WHO, 2015).

Ogunayo, (2015) posited that there are several factors that affect a person's attitude to sanitation. For instance, some people don't have access to proper sanitation because they think they cannot afford it, probably, because of their level of income; or they see no reason to use an improved sanitation; while others don't know where to get one or have access to it. The preferred sanitation method varies from people to people as it has to do with their beliefs (religion), knowledge (awareness), level of income (affordability) and their access to water supply. Ownership of a latrine does not automatically translate into use as pointed out by (Sinha *et al.*, 2017). This might be connected to an established age old practice, where little or no stigma is attached to it coupled with a generally low awareness of the benefits of hygiene. Factors adduced to account for latrine use as exemplified by Sinha *et al.*, (2017) are family size, privacy and safety for women and girls. Others are: socioeconomic status of the households and female literacy rate. Additionally, receipt of subsidies from the government, social cohesion, peer influence, access to water, supply-related and structural issues related to latrine construction have also been spotted as determinants of latrine use.

An average Nigerian is estimated to generate about 0.4kg of solid waste per day with households and commercial centres contributing almost 90% of the total waste generated in urban centres (Oloruntade, Adeoye, and Alao, 2014). In addition, refuse is generally buried and burnt dumped openly on available spaces, burnt open on the side of the road, set on fire in a little corner in their backyard or in a very open place. Some of the challenges facing solid waste management include inadequate waste collection vehicles, accumulation of garbage on the streets and on open spaces, lack of waste treatment and disposal sites and inappropriate Information Management System. Most household wastes attract organisms, insects and rodents that can transmit diseases like diarrhoea to humans and this spreads very fast when in close proximity to residences. (Ogedengbe and Oyedele, 2006) as cited in (Fakere, Fadairo, and Oriye, 2012).

Attitude has to do with people's reaction or disposition to situations. Attitude could be described as negative or positive, good or bad, welcoming or rebuffing (Eneji, Eneji, Ngoka, and Abang, 2016). The attitude of people towards waste management can be affected by their level of knowledge and awareness of waste management and it has been reported that homes with waste bins engage more in the proper way of storing waste than homes without waste bins (Adogu *et al.*, 2015). Adequate sanitation, together with good waste management and safe water, is essential for good health and to social and economic development (Alpana, 2016).

The Federal low cost housing unit (Shagari) that is meant for low income earners, is presently bedevilled with lot of challenges. These include: poor accessibility to water supply, and poor sanitation facilities, indiscriminate disposal of wastes. Another problem that is visible, is that the well water used for domestic purposes like drinking, cooking, laundry, etc. might have been contaminated by rain water mixing with solid waste and percolating through porous soil. Availability of water determines the type of toilet that can be used, for without a running water, there can't be a proper toilet usage. Where toilets are not available, people have no choice but to defecate in open spaces which leads to messing up of the environment. The aim of this study is to assess the water supply and, sanitation in the Federal Low Cost Housing Estate, Akure. This is with a view to suggesting better ways of solving the environmental problems prevalent. The objectives of the study are to assess the association between: (i) the type of sanitation facility available and water sources, (ii) the association between income of the respondents and toilet facilities available, the association between gender and toilet facilities present, the association between gender and water sources, the association between water collectors and water sources, and (v) the distance of water sources and the litres of water available to households in the Federal Low-cost housing estate, Akure.

2 Research Methodology

The Federal Low Cost Housing is located in Akure the capital in Ondo State, Nigeria. The estate is situated about 2 kilometres from Akure. It is bounded on the south by Ilesha-Owo express way. Other prominent features located around the estate are: Gbeleaje estate and the federal government site and service scheme along Irese road. The area is undulating, and interrupted by rock outcrops. The area is well drained and have a stream that traverses it. The initial projection is an estate containing a population of 1,080. They are expected to occupy 400 one-bedroom core housing units and 120 three bedroom housing units. The plot sizes range from 18m by

36m for one-bedroom housing units, while the three bedroom apartments occupied 30m by 30m. In some instance, the dimensions were not strict, as some of the layouts were more than the mentioned sizes due to the physical constraints such as hills, rock outcrops, rivers, roads and other landforms. There is the provision that the number of dwellers could increase to about 4,680, because, the owners of the one-bedroom houses could extend their dwellings to three-bedroom houses as their income, and household members increased.

This estate was designed such that it has all the elements of a neighbourhood. This is an estate that occupies an area of 74.16 hectares. It has a residential area covering 36.25 hectares (48.88%) while the commercial land use covers 2.59 hectares (3.49%). Open space/recreation covers 15.42 hectares or 20.79% of the total land area. Also, it was discovered that while public/semi-public cover 4.0 hectares (5.39%), circulation occupied 15.90 hectares or 21.45% of the land area. As at the time of allotment, it was reported that 400 one-bedrooms and 120 three-bedrooms were constructed. Plot sizes range between 18m by 36m for a one-bedroom housing unit, and 30m by 30m for a three-bedroom housing unit.

The Research population for this study were the head of households in the federal low cost housing, estate. The buildings on the estate were derived using digitized Google Earth Imagery of the area. The result of this exercise, showed that there are 194 buildings, low cost housing unit which is the target population for the research (see Figure 1). The sampling size for this study is the total buildings in the study area. In essence, 194 Questionnaires were administered to the buildings in the area. The study employed the cluster sampling method where all the buildings were used for the study. This study targeted the household heads, in cases where the household head is not available, an adult who has the knowledge about the household water and sanitation systems was selected as a respondent. The coding and processing of data collected for this research was analysed using the IBM statistical packages for social scientists (SPSS) version 22, the Arc Map GIS version 10.4 and Microsoft Excel 2013.



Figure 1: Federal Low Cost Housing Estate, Akure
Source: Author' Field Work, 2019

3.0 Data Analysis and Interpretation

3.1 Source of water for household

The sources of water that is common in the estate are the hand dug wells with cover, and dug well without cover, and bore holes. In addition, there is a stream that traverses the estate, ponds and other sub surface water. Findings as depicted in Table 1 revealed that 20.1% of the respondents get their water supply from Hand Dug well

without cover, 52.6% of them derived their water from Hand Dug well with cover, 25.3% of the respondents get their water supply from Hand Dug well with tap and 2.1% of the respondents get their water supply from bore holes.

Table 1: Source of water for household

Sources of water supply	Frequency	Percentage (%)
Hand Dug Well Without Cover	39	20.1
Hand Dug Well With Cover	102	52.6
Hand Dug Well With Tap	49	25.3
Bore hole	4	2.1
Total	194	100

Source: Author's Field Work, 2019

3.2 Location of the water supply

In order to access the accessibility of residents to water sources, the location of water on their premises were accessed. The outcome of the research as shown in Table 2 revealed that the majority of them source their water from outside their premises. As observed in the research, 53.1% of the respondents located their water source outside their compound, while the water source for 46.9% of the respondents was within their premises.

Table 2: Location of the water supply

Location of Domestic water	Frequency	Percentage (%)
Within the house	91	46.9
Outside the house	103	53.1
Total	194	100

Source: Author's Field Work, 2019

3.3 Type of Toilet Facility

In order to assess the types of toilet prevalent within the estate, pour-flush, water closet and pit latrine were considered. The research findings as shown in figure 2, revealed that the major toilet present in most households in the study area was the water closet 67.5%, while the pour flush toilet was used by 25.3% of respondents. Respondents that use the pit latrine were 6.2%, while households with no facility were 1.0%.

3.4 The Association between Toilet facilities and the sources of water

Findings as shown in Table 3 show that respondents that have water available tend to use improved toilet facilities. For instance, all the 67.5% residents that use water closet are accessible to hand dug wells (covered or not covered), and bore holes. On the other hand, it was discovered that respondents who had pit latrines were accessible to hand dug well without cover.

The study further revealed that hand-dug covered well is the most prevalent source of water by 35.1% of the residents. It is pertinent to mention that the two cases among the residents who were without a sanitation facility came into the estate in recent times. A cross tabulation analysis was run between the type of toilet facilities and the sources of water available to households in the study area. The result revealed that there was an association between installed toilet facilities by head of households and their water sources ($X^2 = 57.62$, $df = 9$, $p < 0.01$).

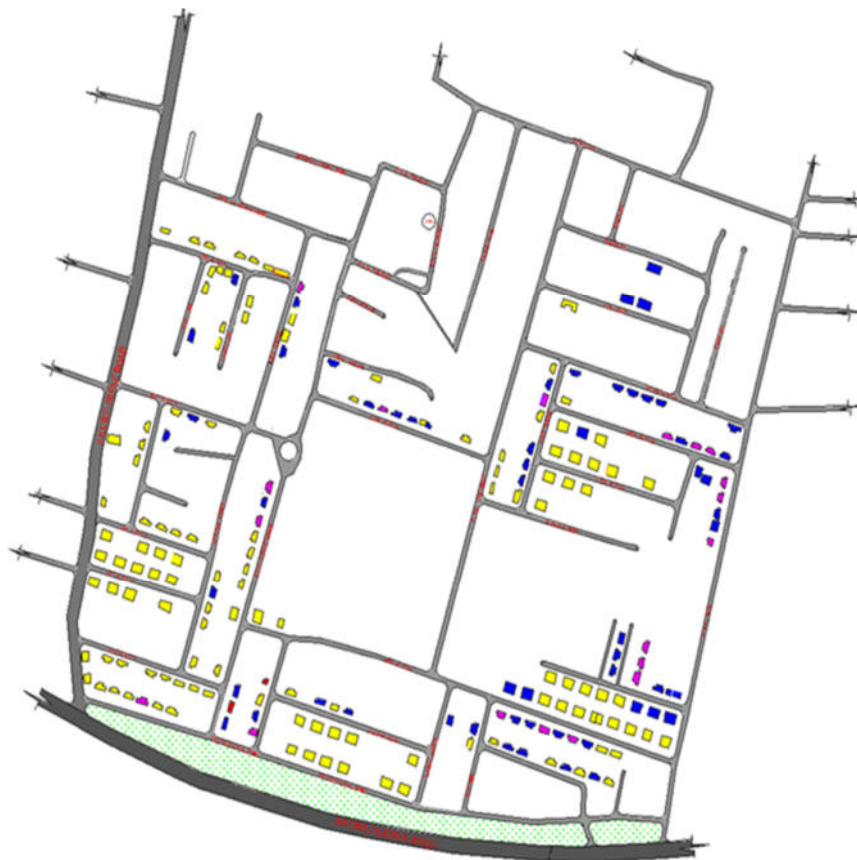


Figure 2: Types of toilet facility in the study area
 Source: Author's Field Work, 2019

Table 3: Association between source of water and type of toilet facility

		Source of water				Total
		Hand Dug Well, without Cover	Hand dug Well with Cover	Hand dug Well with Tap	Borehole	
Type of Toilet facility	Water closet	24 12.4%	68 35.1%	37 19.1%	2 1.0%	131 67.5%
	Pour flush	3 1.5%	32 16.5%	12 6.2%	2 1.0%	49 25.3%
	Pit latrine with slab	12 6.2%	0 .0%	0 .0%	0 .0%	12 6.2%
	No facility	0 .0%	2 1.0%	0 .0%	0 .0%	2 1.0%
	Total	39 20.1%	102 52.6%	49 25.3%	4 2.1%	194 100.0%

Source: Author's Field Work, 2019

3.5 The Association between income and the type of water source

A cursory look at table 4, revealed that people with high income use hand dug well that was covered and hand dug wells piped into their premises. It was also revealed that people below the 60, 000 Naira income level, and uses hand dug well without cover (20.1%). The association between income and sources of water was tested using the Chi-square and the result showed that there is no significant association between the variables ($\chi^2 =$

10.77, $df = 6$, $p > 0.05$). It can be concluded that irrespective of income level, almost all the respondents have access to a water source. For instance hand-dug well (covered or not covered) was the water source for 29.9% of the low-income earners (income below 30, 000 Naira). Among the 18.6% in the middle income cadre (income between 30, 000 to 60, 000 Naira), and 4.1% of the high-income earners (income above 60, 000 Naira), the hand dug well that was covered and bore hole was their source of water.

Table 4: Association between source of water and income

		Source of water				Total
		Hand Dug Well, without Cover	Hand dug Well with Cover	Hand dug Well with Tap	Borehole	
Level of income	Below 30, 000 Naira	15 7.7%	58 29.9%	23 11.9%	3 1.5%	99 51.0%
	30, 000 - 60, 000 Naira	24 12.4%	36 18.6%	23 11.9%	1 .5%	84 43.3%
	60,000 - 90, 000 Naira	0 .0%	8 4.1%	3 1.5%	0 .0%	11 5.7%
Total		39 20.1%	102 52.6%	49 25.3%	4 2.1%	194 100.0%

Source: Author's Field Work, 2019

3.6 The Association between Gender and type of toilet facility

The study as shown in table 5 revealed that patronage of sanitation facility decreases from the water closet to pour flush, pit latrine with slab and no facility. Interestingly, 47.4% of female respondents had a water closet in their house as against 20.1% of male headed households. Whereas, 14.4% of female headed households had pour-flush toilet. The study showed that 10.8% male headed households use pour-flush toilet. Besides, the study showed that only female headed household was in the category of respondents using the pit latrines and the 1.0% who were without a toilet facility. The Chi-square result showed that there is an association between gender and type of toilet ($X^2 = 9.62$, $df = 3$, $p < 0.05$).

Table 5: Association between Sex of respondents and the type of toilet facility

		Type of Toilet facility				Total
		Water Closet	Pour flush	Pit latrine with slab	No facility	
Sex of the respondent	Male	39 20.1%	21 10.8%	0 .0%	0 .0%	60 30.9%
	Female	92 47.4%	28 14.4%	12 6.2%	2 1.0%	134 69.1%
Total		131 67.5%	49 25.3%	12 6.2%	2 1.0%	194 100.0%

Source: Author's Field Work, 2019

3.7 Association between Gender and the water source.

Findings from this study in table 6 revealed that there is no gender discrimination in the spread of water available for domestic use. The only variation is the 2.1% female respondents that uses bore hole as water supply. Findings revealed that hand dug with cover is the most available water source (52.6%). The least available water source in the estate was borehole. This is because it is the most expensive in term of installation and maintenance. The association between gender and water sources was also considered using the Chi square. The Chi square result showed that there is an association between gender and water source ($X^2 = 53.45$, $df = 3$, $p < 0.01$).

Table 6: Association between Gender and the water source.

		Source of water				Total
		Hand Dug Well, without Cover	Hand dug Well with Cover	Hand dug Well with Tap	Borehole	
Sex of the respondent	Male	3 1.5%	22 11.3%	35 18.0%	0 .0%	60 30.9%
	Female	36 18.6%	80 41.2%	14 7.2%	4 2.1%	134 69.1%
Total		39 20.1%	102 52.6%	49 25.3%	4 2.1%	194 100.0%

Source: Author's Field Work, 2019

3.8 Distance of water source and water collectors

The burden of caring for family members who are ill with waterborne diseases and going for water often falls disproportionately on female members of the household KNBS, 2010 as cited in Koskei et al., 2013. A cross-tabulation was done between the distances of water source to water collectors. The result, as shown in table 8, revealed that adult women were the major water collectors (34.3%). This was followed by households where water collection involved adult women, Boy child, and girl child (27.3%). Households where only the boy child and the girl child collect water was 27.3%. Adult men recorded the least people involved in water collection, they account for 11.1% of water collectors in the estate. The association between distance of water source and water collectors using the Chi square test of significance was ($\chi^2 = 26.01, df = 6, p < 0.01$)

Table 7: Distance of water source and water collectors

		Water collector				Total
		Adult men	Adult women	Adult women, Boy Child, Girl Child	Boy child and Girl Child	
Distance of water source To house	0.1km-1.0km	11 11.1%	13 13.1%	15 15.2%	23 23.2%	62 62.6%
	1.1km-2.0km	0 .0%	21 21.2%	12 12.1%	3 3.0%	36 36.4%
	2.1km-3.0km	0 .0%	0 .0%	0 .0%	1 1.0%	1 1.0%
Total		11 11.1%	34 34.3%	27 27.3%	27 27.3%	99 100.0%

Source: Author's Field Work, 2019

3.9 Distance of water source and litres of water Available in the Households.

Table 8 show the findings between the distance of water sources and the quantity of water (in litres) fetched in the household. The outcome of the research revealed that most of the respondents (62.4%) travel less than 1.0km. The proportion of the residents travelling between 1km and 2km to water sources was 36.4%, while only 1.0% of the residents travel more than 3km to fetch water. The outcome of this research showed that the longer the distance, the more litres of water the residents stores in their houses. In essence, it was discovered that when the distance was less than 1km, 18.2% of the respondents have about 60 litres of water, whereas, when the distance was more than 2km, more than 60litres of water was stored. The Chi-square result showed an association between distance and quantity of water ($\chi^2 = 23.54, df = 8, p < 0.01$).

Table 8: Distance of water source and litres of water Available in the Households.

		Litres of water					Total
		Less than 20litres	30-39litres	40-49litres	50-59litres	60litres and above 60 litres	
Distance of Water source to the house	0.1km-1.0km	0	19	3	22	18	62
		.0%	19.2%	3.0%	22.2%	18.2%	62.6%
	1.1km-2.0km	4	7	0	3	22	36
		4.0%	7.1%	.0%	3.0%	22.2%	36.4%
	2.1km-3.0km	0	0	0	0	1	1
		.0%	.0%	.0%	.0%	1.0%	1.0%
Total		4	26	3	25	41	99
		4.0%	26.3%	3.0%	25.3%	41.4%	100.0%

Source: Author's Field Work, 2019

4.0 Discussion of Findings

This study examined the objectives of the study at the Federal low cost housing in Akure, Nigeria. A few observations emerged from this estate that was meant to be a comfortable haven for the residents. First, the association between the type of sanitation facility available and water sources was significant ($X^2 = 57.62, df = 9, p < 0.01$). Second, the association between income and type of water sources of the respondents was significant at less than 0.01 ($X^2 = 10.77, df = 6, p > 0.05$). Third, the association between gender and toilet facilities was not significant at less than 0.05 alpha level ($X^2 = 9.62, df = 3, p > 0.05$). Four, gender and water sources was significant at less than 0.01. Fifth, the association between water collectors and water sources was significant at less than 0.01. Lastly, the distance of water to the residents and the litres of water available was significant at less than 0.01 alpha level, ($X^2 = 23.54, df = 8, p < 0.01$).

The placement and layout of the buildings within the estate followed a planned and well laid-out houses, with adequate access to each building by roads. As observed earlier, the layout consists of one-bedroom flats, and three-bedroom flats. In most of the buildings, the bathrooms, toilets and kitchens are located within the buildings. This was a clear departure from the core part of the city as reported by (Olotuah, 2010). Though the roads were well laid out, they are in a state of disrepair bringing hardship to residents in the estate. This estate is an epitome of the waste of public facilities provided without proper monitoring. The urban areas in Nigeria is fraught with shortages of adequate or dilapidated water and sanitation facilities (Olotuah, 2010). Septic tanks that have been filled are not emptied because there are no vacuum empties (manual and mechanical) available. The existing services in urban areas are only available to a diminishing proportion of the population. A quantum is left to grapple with overstrained and almost collapsing services.

5.0 Conclusion and Recommendations

In this vein, improvement to most of the houses in this estate is necessary. This should be lined with the sustainability principles, applied in the conception, construction and in the use of the buildings. This can be observed in the reconstruction of some of the buildings, because of an increase in family size, improvement in salaries and status of the residents and changes in modern trend in building construction.

In conclusion, the paper had examined the condition of water and sanitation in a Federal low-cost housing scheme that was established over three decades ago. It noted the impact of rapid urban development that have impacted on the estate. This can be attributed to the global trend in urbanisation which had changed the socioeconomic profile of the residents. It discovered among others the people responsible for water fetching, gender and water, gender and sanitation. In order to ensure better and salubrious environment, it is recommended that the water facilities be renovated and improved, sanitation facilities should be renovated, while vacuum evacuators should be procured to empty filled septic tanks.

As mentioned earlier, the JMP's definition of improved drinking water sources includes, piped water on the premises, (i.e., a household water connection located inside the user's dwelling, plot or yard), public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection. The pertinent issue that is of concern in this estate, is whether the available water is of drinking quality, or whether access is sustainable. On the other hand, the JMP's definition of an improved sanitation facilities includes flush/pour flush to a piped sewer system, septic tank or pit latrine, and three types of latrines – ventilated improved pit latrines, pit

latrines with slabs, and composting toilets. The problem, however, is that consideration was not given to the issue of safe disposal of excreta. Also, when issues of a consistent increase in the population of a place under consideration are given a proper perspective, it will be discovered that their plot sizes may not be able to accommodate shifting of the pits, when the old ones are filled up. Emptying of the pit latrine and the septic tanks is still a challenge in Akure, where the estate is located. Where residents use the pit latrines, they need to be easily emptied, and this is particularly difficult especially due to bad roads. Besides, large pits or a second latrine, which reduce the frequency with which they need to be emptied, are difficult in high density settlements. The most effective systems that is recommended is the sewerage system, where the effluents from the respective houses are centrally disposed and treated.

Any sanitation intervention that has not connected toilets to sewers needs to take account of the collection, disposal and treatment of the faecal matter. Findings from the study revealed that the pits cannot be emptied easily, and there are no local treatment plants to treat wastes from the pits and soak-away pits. In fact, there is no knowledge of the availability of conventional pit-emptying trucks in the city of Akure. Quite disturbing is the possibility of water contamination of water sources from the pit latrines and the soak-away pits, when they are filled-up and are not quickly emptied. In view of the above, communally owned water and sanitation should be introduced to this estate. This is a case as obtained in Brazil, where water and sanitation is jointly owned and maintained. Its advantage is that expenses can be shared and sustainability is guaranteed.

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