

# Factors Promoting Usage of Non-Traditional Water Alternatives in Lokoja Town, Kogi State, Nigeria

<sup>1</sup>Abenu Abigail, <sup>2</sup>Kenneth O. Iwugo and <sup>3</sup>Nasiru Idris Medugu

<sup>1,2and3</sup>Department of Geography, Faculty of Social Sciences, Nasarawa State University, Keffi, Nigeria

## ABSTRACT

*Domestic water supply in Lokoja town is from diverse sources: rain water harvesting, potable water supply, groundwater, water vending and water from river/streams. In addition, inhabitants of Lokoja town have also turned to grey water, which is a non-traditional alternative water source to meet non-potable water needs in their households. This research investigates the factors that promote grey water usage in Lokoja town. The selection of 206 households who were involved in this survey came about through a multi-stage sampling process. The household survey reveals that water scarcity and negative perceptions about the present state of water supply were principally responsible for people utilizing grey water in their households. Other factors responsible for the adoption of grey water use are high water rate and willingness to use water efficiently.*

**KEYWORDS:** Grey water, Water alternatives, Water needs, Water sources, Lokoja-Nigeria.

## 1. INTRODUCTION:

Fresh water is becoming more elusive to people. Half of the world's population will be residing in high water stressed areas by the year 2030 (UNESCO, 2014). Population growth, urbanization, climate change are among several factors putting great pressure on water resources (Winward, 2007).

In the face of the dwindling global fresh water resources, wastewater reuse has been identified as one way of providing a non-traditional alternative water source, as well as conserving water (Adewumi, 2011). Waste water constitutes water that has been used once (Abbey, 2013). When treated, wastewater can be used for beneficial purposes after its first use (National Academy of Sciences, 2012). The absence of wastewater treatment schemes in some areas have not deterred people from reusing wastewater for non-potable uses, especially when they considered the water to be less contaminated (Le, 2005). Grey water which is wastewater that is generated from laundry, bathing, kitchen sinks and dish washing (Karabelnik et al., 2012); makes up about 50% - 80% of total water used in households. It offers a great potential as an alternative water source (Allen, Christian-Smith, and Palaniappan, 2010; Adewumi, 2011).

Many developing countries have been unable to provide the basic water requirements for its people domestic needs. Nigeria and Ghana are examples of developing countries where water gap exist between domestic water demand and supply (Butler and Memon, 2006; Abbey, 2013). The spatial and temporal variability of water resources in Nigeria coupled with decaying and inadequate water infrastructure has compounded domestic water problems (Federal Ministry of Water Resources, 2004; El-Rufai, 2013). To cope with the inadequate potable water supply people have turned to alternative water sources (Abbey, 2013).

In Lokoja town, a rapidly growing urban area, residents have had to rely on several sources of domestic water supply to meet their basic water need (Yusuf and Agabe, 2010; Abenu, 2016). Rain water harvesting, stream/ river water, water vending, groundwater constitute the traditional alternative water sources in Lokoja town. The domestic water consumption in the town is about 48litres/capita/day. To complement the water from traditional water sources, residents have also adopted grey water. Grey water usage was observed across planned and unplanned neighbourhoods in the town , where it was used for non-potable applications like toilet washing, car or motorcycle washing, irrigation of gardens and road or street wetting (Abenu, 2016). This study consequently investigates the factors that promote the use of grey water in Lokoja town across planned and unplanned neighbourhoods.

## **2. STUDY AREA**

Lokoja town, the study area, has a land mass of 3,518 km<sup>2</sup>. It is located between latitude 7<sup>0</sup> 45<sup>1</sup> and 7<sup>0</sup> 52<sup>1</sup> north of the equator. Its longitude stretches from 6<sup>0</sup> 39<sup>1</sup> to 6<sup>0</sup> 49<sup>1</sup> east of the Greenwich meridian. It covers about 12% of the total land mass of Kogi state and has a population of 196,643 (National Population Commission, 2006).

Wet and dry seasons are the two distinct seasons in Lokoja town. According to Audu (2012), Lokoja enjoys rainfall that ranges between 804.5mm to 1767.1mm. 27.7<sup>o</sup>c is the mean daily temperature (Audu and Rizama, 2012).

Lokoja is a confluence town as a result of rivers Niger and Benue, the largest rivers in Nigeria, converging in the area. There are also some small streams in the study area, prominent among them are: Mmeme, Akpomoba and Donko.

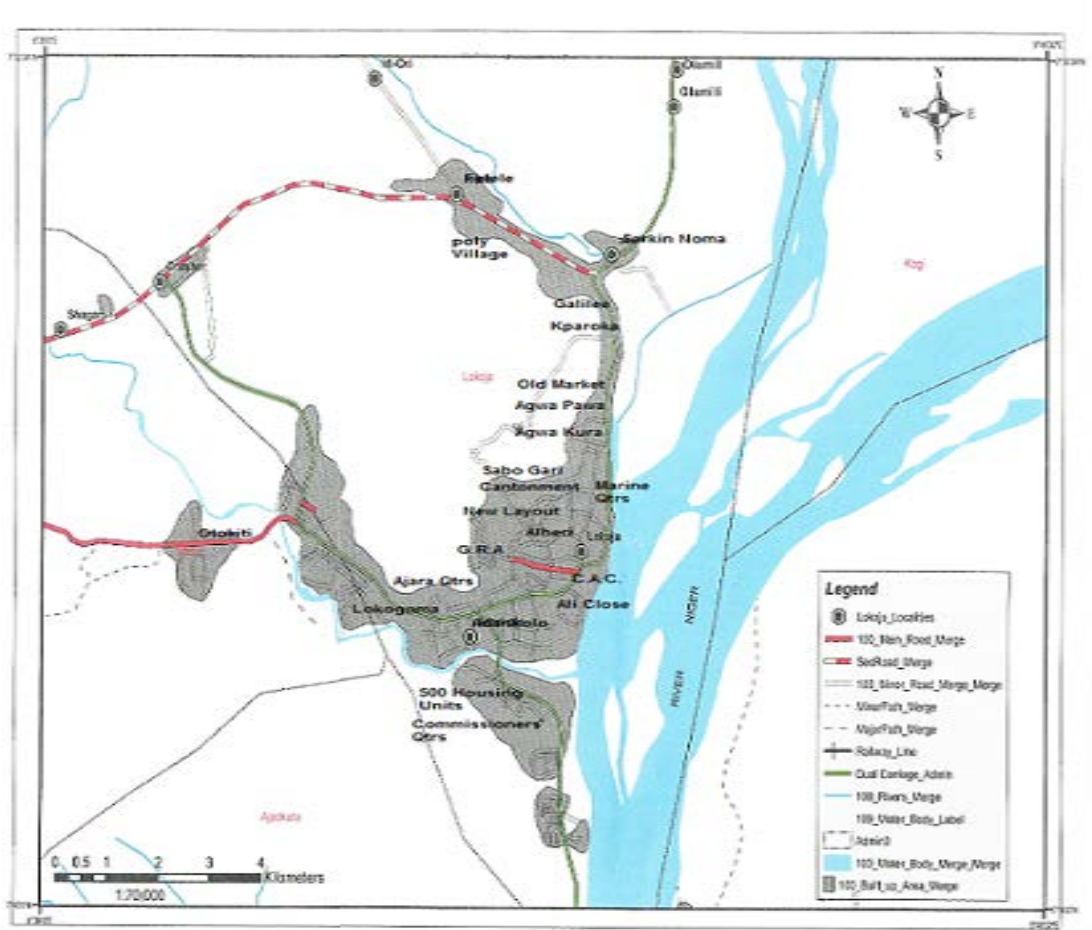


Figure 1: Lokoja Neighbourhood Map

Source: Findings and Solution Consult Abuja, 2013

### 3. METHODOLOGY

Data obtained from the structured interview schedule administered to heads of households was the primary source of data used in this study. 524 households were involved in the survey, with most of the respondents (n= 372) coming from unplanned neighbourhoods of the town. The unplanned neighbourhoods (n=14) were more than the planned neighbourhoods (n=8) in the town. A multi-stage sampling technique was employed for the household survey in Lokoja town. At the first stage of the sampling process, stratified random sampling was used in the selection of neighbourhoods. To achieve proportional representation of the two stratum, planned and unplanned neighbourhoods, the unplanned neighbourhoods selected were six and the planned neighbourhoods were three. The selection of the nine sampled neighbourhoods was in the ratio of 1:2. Systematic sampling was used thereafter in selecting the individual households

at the second stage of the sampling process from the nine neighbourhoods chosen. Every tenth unit household from the selected neighbourhood was chosen for inclusion in the household survey. Of the 524 respondents, 206 were the ones who used grey water. This meant that the result presented reflected what took place in 206 households.

Table 1: Grey Water Utilization in Sampled Neighbourhoods

Neighbourhoods		Frequency	Adoption of Grey Water Reuse	
			No (in%)	Yes (in%)
Planned Neighbourhoods	Ali Close	46	18(39.1%)	28(60.9%)
	Lokogoma	74	61 (82.4%)	13 (17.6%)
	Otokiti	32	24(75.0%)	8(25.0%)
Unplanned Neighbourhoods	Adankolo	78	55(70.5%)	23(29.5%)
	Felele	124	78(62.9%)	46(37.1%)
	Galilee and Kporoka	14	7(50.0%)	7(50.0%)
	Old Market and environs	64	22(34.4%)	42(65.6%)
	Poly Village	24	14(58.3%)	10(41.7%)
	Sarkin Noma	68	39(57.4%)	29(42.6%)
Total		524	318	206

Source: Fieldwork, 2014

#### 4. FINDINGS AND DISCUSSION

Grey water utilization was not practised by all the households in Lokoja, out of the 524 households visited in the course of using multi-stage sampling to select households, 206 were the ones who adopted grey water reuse for non-potable applications. For those who use grey water, the factors that facilitated this action were examined across the sampled neighbourhoods.

##### i) **Negative Perceptions of the Present State of Water Supply**

The Perceptions of respondents about the present state of water supply in Lokoja influenced grey water utilization. Among respondents who held the view that the present state of water supply in

the town was very poor or poor, a large proportion adopted grey water reuse (Figure 2). The respondents who held the view that the state of water supply was very poor were found across all the sampled neighbourhoods, both in places with access and those without access to potable water supply. Their way of dealing with the water insufficiency was to take to the use of grey water in considerable proportion as reflected by the result, where, in one instance, the usage of grey water was as high as 75.0%. This result indicates that respondents were open to the use of various water sources to meet their domestic water needs.

A hundred percent grey water practice was observed in two neighbourhoods, Old market and environs; and Galilee and Kporoka; for those who declared that the present state of water supply was poor. However a relatively low percent (<40%) was seen in Adankolo and Otokiti, for those who said the present state of water supply was poor.

There was another category of respondents: those who had a rather positive view about the present state of water supply. They felt that the current state of water supply in the state was either good or very good. Their level of adoption of grey water was relatively low. Less than 40 percent of respondents who held this particular view utilized grey water in most cases. However, a few exceptions were noticed in Galilee and Kporoka; and Sarkin-Noma; where respondents, in spite of holding the view that the present state of water was very good, still had an appreciable percentage of respondents who utilized grey water. Though the outcome in Galilee and Kporoka; and Sarkin-Noma somewhat contradicts this positive view, it is possible that their perception was influenced by the fact that they now had potable water, unlike in the past, prior to the inception of the Greater Lokoja Water Supply Scheme in 2011, when their access was very low. However, to have all their water needs met they still resorted to the use of grey water.

It was observed that the expressed negative perceptions occurred more in areas that were not integrated into the Greater Lokoja Water Scheme; mostly in the unplanned neighbourhoods. Places where potable water was readily available and homes where individual households were connected to the potable water source held more positive views of the present state of water supply in Lokoja.

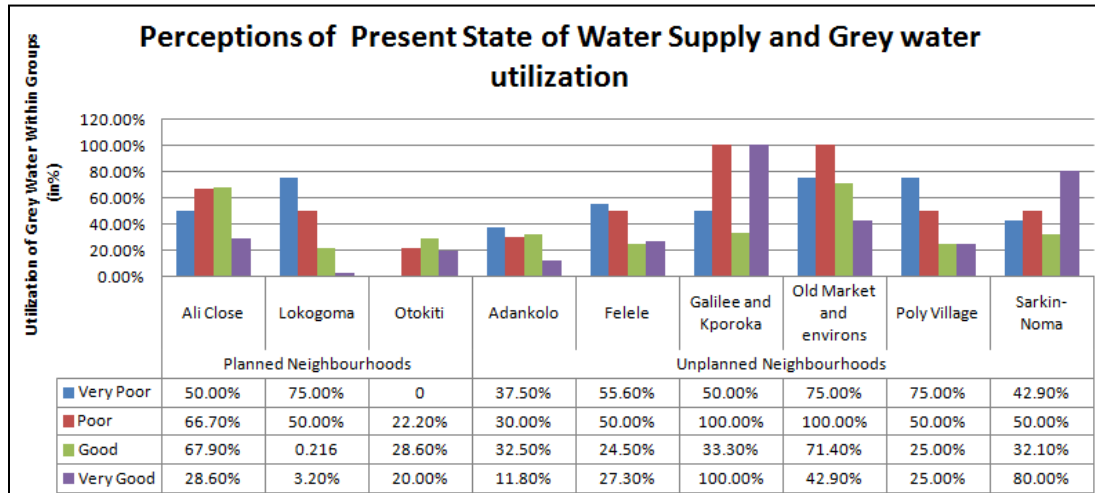


Figure 2: Perceptions of Present State of Water Supply and Grey water utilization in Lokoja

Source: Fieldwork, 2014

### ii) Scarcity of Water

Scarcity of water occasioned by irregular potable water supply, problems of long queues at communal stand taps and non supply of potable water in some neighbourhoods, have made many households to embrace grey water reuse. Water scarcity in Lokoja is not purely hinged on lack of surface water but the problem of maintaining a 24-hour daily provision for a town that is growing rapidly; and expanding the present pipe network. Approximately 68 percent of the households which utilize grey water in Lokoja do so singularly because of water scarcity.

In seven out of the nine sampled neighbourhoods, more than 50 percent of those who reused grey water did so because of water scarcity (Table 2). In Felele alone, where the highest percentage of grey water reuse because of scarcity was observed, water scarcity accounted for why 80.5% of all the respondents utilized grey water in the neighbourhood. There were only two neighbourhoods, Lokogoma; and Galilee and Kporoka; where the influence of water scarcity on utilization of grey water was most minimal. Less than 50 percent of respondents in these neighbourhoods admitted to using grey water because of scarcity of potable water. Indeed, water scarcity played a significant part in the number of respondents who adopted the use of grey water as 140 out of the 206 respondents who reused grey water did so because of it.

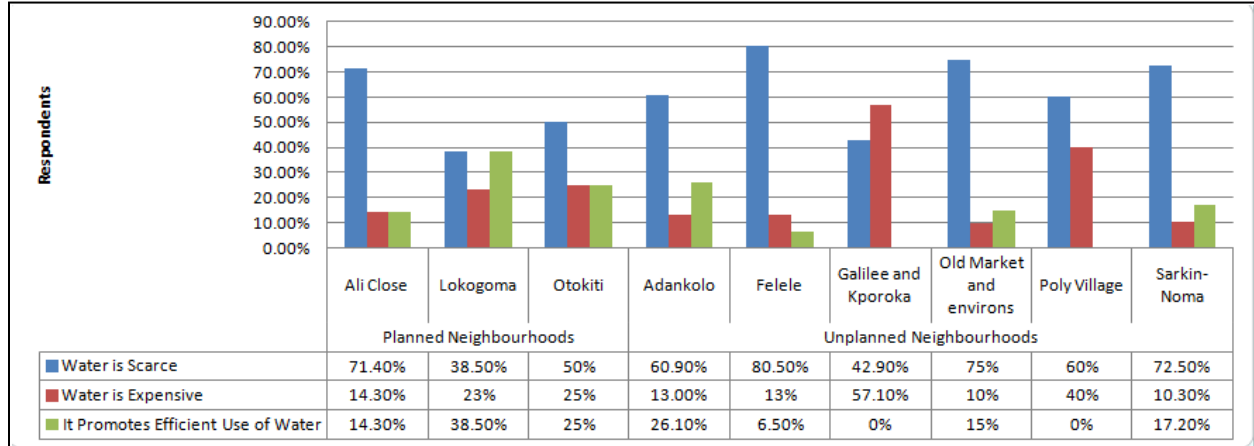


Figure 3: Reasons for Grey Water Utilization

Source: Fieldwork, 2014

**iii) High Water Rate**

Water rate was adjudged to be expensive by some respondents. This particular factor made them to consider grey water reuse. Respondents in two neighbourhoods, Galilee and Kporoka, as well as Old market and environs, had a considerable percentage of their households (>40%) engaging in this practice because of the high cost of water (Table 2). These neighbourhoods are unplanned with a large proportion of the heads of the households belonging to the income groups that earn below ₦20, 000 and those who earn ₦20, 000- ₦40, 000 which means they are more likely to look for alternatives that would make them spend less on water bills. Approximately 16 percent of the households within the sampled neighbourhoods that took up grey water reuse did so for the purpose of wanting to save money that would have been spent on water.

**iv) Water Efficiency**

About 16 percent of respondents who used grey water in the nine sampled neighbourhoods had efficient use of water as the reason for utilizing grey water in their households. This factor, though not as significant as water scarcity being responsible for facilitating grey water utilization, was still an important reason for utilizing grey water. It was noted that Lokogoma which had the highest percentage (38.5%) of its respondents using grey water because they wanted to use water efficiently, is a neighbourhood connected to the Greater Lokoja Water

Supply Scheme. The supply of potable water to the neighbourhood for an upward of 5- 7 days in a week did not deter the reuse of grey water.

This result thus indicates that regular potable water supply and the availability of other domestic water sources did not stop some respondents from adopting grey water reuse. They had clearly and commendably taken water stewardship as a responsibility, irrespective of access to potable water supply in Lokoja.

Table 2: Reasons for Grey Water Utilization in Lokoja

Neighbourhoods		Reasons for Grey Water Utilization					
		Water is Scarce		Water is expensive		It Promotes Efficient Use of Water	
Planned Neighbourhoods		N	Percent	N	Percent	N	Percent
	Ali Close (N=28)	20	71.4%	4	14.3%	4	14.3%
	Lokogoma (N=13)	5	38.5%	3	23%	5	38.5%
	Otokiti (N=8)	4	50%	2	25%	2	25%
Unplanned Neighbourhoods	Adankolo (N=23)	14	60.9%	3	13.0%	6	26.1%
	Felele (N=46)	37	80.5%	6	13%	3	6.5%
	Galilee and		42.9%		57.1%	-	-



	Kporoka (N=7)	3		4			
	Old Market (N=40)	30	75%	4	10%	6	15%
	Poly Village (N=10)	6	60%	4	40%	-	
	Sarkin Noma (N=29)	21	72.5%	3	10.3%	5	17.2%
	Total	140		33		33	

Source: Field work, 2014

## 5. CONCLUSIONS

Factors that promoted grey water reuse include: perceptions that the state of water supply was very poor or poor, water scarcity, high water rate, and the need to use water efficiently. Majority of the people who were of the opinion that the state of water supply was either very poor or poor saw the need to make use of grey water. Water scarcity in the dry season when rainwater is not available for rainwater harvesting, and severe cases of potable water rationing persist, all combined to make water scarce for inhabitants, forcing them to choose between using grey water and buying water from water vendors. Wise use of water where grey water was properly allocated to non-potable uses was also a factor that made some respondents to adopt grey water in some neighbourhoods. There is the need to educate people in both the formal and informal settings on the need to adopt grey water reuse as a way to conserve water for future use using various mediums to transmit the information. More research on wastewater utilization is recommended not only in households but in the agricultural and industrial sectors, with particular focus on quantity utilized, health implications and treatment options.

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