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Evaluation of the Public Pipe-borne Water supply in Ilorin West Local Government Area of Kwara State, Nigeria

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Abstract: This paper assesses the residents' access to public pipe-borne water in Ilorin West Local Government Area of Kwara State, Nigeria. The authors analyzed spatial distribution and functionality of public pipe-borne water. They also examined intra-urban variation in the distribution of public pipe-borne water in the study area. The study used primary data which were obtained through random sampling techniques of 400 households, using structured questionnaire in the twelve political administrative wards of the examined area. Physical enumeration was also adopted to identify the functional and non-functional public pipe-borne water points. Descriptive statistics in the form of frequency table and percentages with chi-square were used to describe residents' demand and accessibility of public pipe-borne water. Analysis of Variance (ANOVA) was used to examine intra-urban variations in the functionality of public pipe-borne water. The results revealed that distribution of public pipe-borne water cut across different localities in the twelve political administrative wards that Ilorin West Local Government consisted of. Although the highest proportion (60.24%) of public pipe-borne water points were observed to be functioning, a significant proportion (39.26%) were not functioning. The highest proportion (95.5%) of the respondents were of the opinion that public pipe-borne water is not regularly available. The findings from Analysis of Variance (ANOVA) revealed significant differences (F=2.702, P=0.004) in the functioning of public pipe-borne water infrastructural elements existing in the examined area. The study concludes by suggesting the need for the government to ensure regular public water supply to meet the residents' daily needs for water consumption and domestic use, which continue to increase every day.
Key words: Public Pipe- Borne water, Water distribution

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1. Introduction

Water is a natural resource of fundamental importance. This is because it supports all forms of life and creates jobs and wealth in the water sector, tourism, recreation and fisheries (Ntengwe, 2005). Without water, life as it exists on our planet, is impossible (Akpabio and Iniobon,, (2013). Potable or drinking water is defined as having acceptable quality in terms of its physical, chemical and bacteriological parameters, so that it can be safely used for drinking and cooking (WHO, 2004). In addition, potable water should be colorless, tasteless and odorless. It should be free from fluorine, arsenic, nitrates, and nitrite and lead contents. Also, potable water should not be associated with water borne disease during and after use. However, human activities comprising discharge of both domestic and industrial wastewaters have resulted in pollution of the common sources of water that are available to households. Water pollution occurs when pollutants with potentials to threaten human and other natural systems find their ways into rivers, lakes, wells, streams, boreholes or even reserved freshwater at homes and in industries (Galadima, Garba, Leke, Almustapha and Adam, 2011).

Nowadays, in Nigeria, research indicates that the majority of common fresh water sources are polluted, resulting in a series outbreak of diseases. The Nigerian government has long considered the provision of water supply and sanitation services to be the domain of the federal, state and local government. The federal government is in charge of water resources management; the state government has the primary responsibility for urban water supply; and local governments together with communities are responsible for rural water supply (Wikipedia, 2012). However, the public sector has not been successful in meeting more than a small part of the demand for water of residential and commercial users. This could be due to deterioration of the necessary infrastructure and poor management of the system. Many water supply systems show extensive deterioration and poor utilization of the existing capacities, due to under-maintenance and lack of funds for operation (Yusuf, 2007). This has resulted in the shortage of potable water supply. For example, out of the 85 million people living in urban and semi-urban areas, less than half have reasonable access to reliable water supply (Yusuf, 2007). Many households, often the poorest, end up purchasing water from private vendors that is very

expensive when compared to the public supply. This study therefore assessed the residents' demand and access to public pipe-borne water in Ilorin West Local Government Area of Kwara State, Nigeria. It analyzed the spatial distribution and functionality of public pipe-borne water supply system. It also examined the intra-urban variation in the distribution of public pipe-borne water in the study area.

2. Statement of the problem

The demand for fresh water is fast increasing at a rate greater than the world's population growth. Access to safe water supply is therefore a serious issue across the globe. Recent statistics indicate that 1.2 and 2.4 billion people suffer from the shortage of safe water supply and sanitation respectively (WHO, 2004). In many developing countries, Nigeria in particular, more than half of the population is affected by the lack of access to safe drinking water (Galadima, et al 2011).

For over one decade, a huge amount of public funds, i.e., estimated at about 82.5 billion Naira, has been spent on the provision and management of water in Nigeria (Wikipedia, 2012). However, there is still no potable water and many lack access to adequate sanitation. More than half of the deaths recorded in the nation's health facilities are caused by complications arising from bad water and poor sanitation (Abaje, and Ishaya, 2009). This has made successive governments and other donor agencies see that they should expand water supply infrastructures, but despite their efforts, the public is still disenchanted because the access to safe water and sanitation is not improving (NEST, 1991; Emosbino and Alayande, 2007).

In Kwara State, for example, the per capita potable water supply in 1976 was 76.4 liters per day. While the average proportion for the whole state was 32.1%. In 1986, the per capita potable water supply increased from 76.4 litres to 101.9 litres a day. The average proportion for the whole state stood at 35.1%. In terms of the proportion of the population of the state having access to potable water, there was no significant change in 1986 in comparison with the situation in 1976 (Onokerhoraye, 1995). This state of scarcity of water has thrown residents of Ilorin metropolis into a difficult position, as most people now spend the better part of a whole day scouring the area for water (Thisday, 2010). In addition, the piped water supply is very poor (faulty, poor quality, low coverage), and – as a result – most residents are dependent on either

boreholes or low quality wells in Ilorin metropolis. Ilorin West local government area is an urban area with an increasing population running a lot of domestic and industrial activities.

Kwara State Water Board (KSWB), whose responsibility is to pump and distribute sufficient clean water to the residents in the study area, is seriously constrained due to its inability to meet the rising demand for domestic potable water. Water consumption and use has however been greatly hampered by the increasing population brought about by the influx of people into the area.

A lot of research has been conducted on the subject matter. For instance, Afolabi (2010) carried out his study on water supply and sanitation situation in Akure, Ondo State Nigeria, with a view to determining the extent of deficiency and what was required to meet the Millennium Development Goals (MDG's) safe drinking water and sanitation target in 2015. The findings from Afolabi (2010) revealed that the majority of residents of the city depended on sources of water supply other than pipe-borne water, which were unsafe for public consumption due to the poor existing pipe lines and outdated network. The study by Saleh and Musa (2012) was aimed at analyzing the nature of water supply and demand in Malumfashi, Katsina state. The result showed a spatial variation of water supply in the study area, some areas had the advantage of water supply over others.

The above studies were outside Ilorin West Local Government area of Kwara State which this present research focuses on. Given the steady increase in the population and complaints by residents that potable water is inadequate, there is a water supply problem which should be investigated. This gave the authors the impetus to carry out an in-depth study on access to public pipe-borne water in Ilorin West local government.

3. Materials and Methods

The information used in this study was drawn mainly from primary and secondary sources. The primary data used for the study were generated from a field survey. This was achieved with the use of structured questionnaire which served as the instrument of data collection and was administered in the study area. The twelve political administrative wards in Ilorin West Local Government constituted the sample frame for this study. They are: Adewole, Ajikobi, Baboko, Balogun Alanamu, Magaji Ngeri, Oloje, Ogidi, Ojuekun/Zarumi, Oko-Erin, Ubandawaki and Warrah/Egbejila. All these political administrative units were selected for the

purpose of data collection. The estimated 2006 population figure is projected to 2017, using 3.2 percent growth rate as given by the World Health Organization (WHO) to get current estimate figure of the study area. To determine the sample size required for this study, Slovin formula, as used by Jeffry and Joyce, (2012), was employed as shown below:

$$n = \frac{N}{1+NE^2}$$

Where: n = sample size

N = population size

E = margin of error * desired

Let the desired margin error be 5%

N = $584,990/1+ (584,990) \times (0.05)^2$

= 584,990/1462.475

= 400

As obtained from Slovin formula, the sample size for this study is 400. This implies that four hundred questionnaires were administered in the study area. It can also be noted that 400 is equivalent to 0.06% of the total projected population. This percentage was also used to determine the number of questionnaires administered in each political ward. Random Sampling Technique was adopted for the data collection method. The size and density of each area influenced the number of questionnaires administered in them.

Information needed as secondary data includes a list of public places connected and supplied with pipe-borne water in Ilorin Metropolis (Ilorin West Local Government). This information was obtained from the Kwara State Water Board.

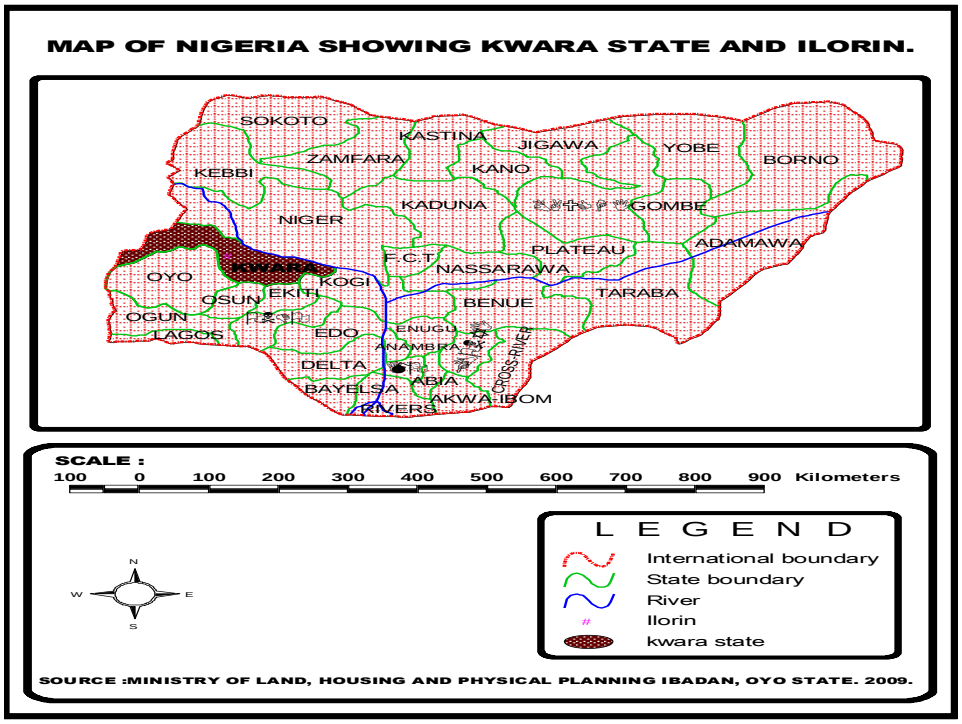
Descriptive statistics in the form of frequency table and percentages with chi-square were used to describe residents' accessibility to public pipe-borne water. Analysis of Variance (ANOVA) was used to examine intra-urban variations in the functionality of public pipe-borne water.

4. Study Area

Ilorin is located on latitude 8°30'N and longitude 4°35'E with an area of about 100km^2 (Kwara State of Nigeria 1997). The city in its geological settings consists of Pre-Cambian

basement complex with an elevation of between 273m and 333m (i.e., 900 ft to 1,200 ft) above sea level. There is an isolated hill (Sobi hills) of about 394m above sea level towards the north of the western part and from 200m to 346m in the east.

Figure 1. Kwara State in Nigeria



Source: *Ministry of Land, Housing and Physical Planning Ibadan, Nigeria, 2009*

5. Results and Discussion

5.1. Spatial distribution and Functionality of public pipe-borne water system in Ilorin West Local Government

In this sub-section, efforts were intensified to examine the spatial distribution of public pipe-borne water and their functionality across Ilorin West Local Government of Kwara State. The distribution of public pipe-borne water cut across different localities in the twelve political wards that Ilorin West Local Government consists of.

Table 1. General functionality of public pipe-borne water in Ilorin West Local Government

S/N	Locality (Area)	Number of pipe-borne water collection points		Total
		Functioning	Not	

			functioning	
1	Adewole	13	10	23
2	Ajikobi	44	18	62
3	Baboko	31	25	56
4	Badari	32	20	52
5	Balogun Alanamu	29	27	56
6	Magaji Ngeri	24	18	42
7	Oloje	26	17	43
8	Ogidi	27	18	45
9	Ojuekun/Zarumi	29	17	46
10	Oko-Erin	16	6	22
11	Ubandawaki	19	12	31
12	Warrah/Egbejila	10	10	20
	Total Number	300	198	498
	Percentage (%)	60.24	39.76	100

Source: authors' fieldwork, 2017

Table 1 describes the observed distribution and general functionality of public pipe-borne water in Ilorin West Local Government. Accordingly, a total of four hundred and ninety-eight (498) public pipe-borne water collection points were discovered and distributed across the twelve (12) political units under study. Out of this number (498), 300 public pipe-borne water points, which accounted for 60.24%, were observed to be functioning, while the remaining one hundred and ninety-eight (198), which accounted for 39.26%, were observed not to be functioning. This implies that although the highest proportion (60.24%) of public pipe-borne water points were functioning in the study area, a significant proportion (39.26%) of the points were also out of use. This situation is not too good and requires paying urgent attention to, taking into consideration the rapid population increase in the study area.

Furthermore, it is also observed that Ajikobi Political ward recorded the highest number of public pipe-borne water functionality, with 44 out 62 in that political ward being in use. The remaining 18 in that Ajikobi ward were observed to be non-functioning. Balogun Alanamun is another political ward, where non-functioning public water supply is the highest, with 27 public pipe-borne water points being out of use.

It could also be noted that non-functionality of public-pipe borne water infrastructure is also high in places like Baboko (25), Badari (20) and Magaji Ngeri, respectively. Thus, efforts

must be intensified to curb the negative trend of non-functionality of public pipe-borne water system in the study area.

5.2. Residents' demand and accessibility of public pipe-borne water and quantity of water supply

In this sub-section of study, an attempt is made to analyze residents' perception of their demand and accessibility of public pipe-borne water supply in the study area. Some of the issues concerned include: residents' access to pipe-borne water, availability of pipe-borne water in the neighborhood, rate (in litres) of water consumption, number of water users in households, and water storage facilities. The others are, among others: length of water supply connections, frequency of water fetch (use, consumption), duration of water fetch in a day, alternative to pipe-borne water.

Concerning the accessibility to pipe-borne water in the study area, the respondents who maintained that it is accessible, accounted for 97.5%, as shown in Table 2, while the respondents who declared that pipe-borne water is not accessible, accounted for 2.5%. Therefore, it can be inferred that the highest proportion of respondents (97.5%) indicated that they have access to public pipe-borne water. This implies that accessibility to regular pipe-borne water is not a problem, the availability of water itself is what constitutes menace, though, as it will be proved in the next table.

The chi-square statistics computed for the analysis of distribution of the respondents by pipe-borne water accessibility in Ilorin West Local Government shows that there is a statistically significant difference in their distribution across the selected political wards in the study area at $p<0.05$ confidence level ($X^2 = 26.445$, df = 11 $p<0.05 = 0.006$).

Table 2. Accessibility to pipe-borne water in the study area

Political ward		Pipe-borne water accessibility		Total
		Yes	No	
Adewole	F	20	3	23
	%	87.0	13.0	100
Ajikobi	F	47	1	48
	%	97.9	2.1	100
Baboko	F	16	0	16
	%	100	0.0	100
Badari	F	27	0	27

	%	100	0.0	100
Balogun Alanamu	F %	81 100	0 0.0	81 100
Magaji Ngeri	F %	36 90.0	4 10.0	40 100
Oloje	F %	21 100	0 0.0	21 100
Ogidi	F %	22 95.7	1 4.3	23 100
Ojuekun/ Zarumi	F %	24 100	0 0.0	24 100
Oko-Erin	F %	25 100	0 0.0	25 100
Ubandawaki	F %	19 100	0 0.0	19 100
Warrah/Egbejula F %		19 100	0 0.0	19 100
Total F %		357 97.5	9 2.5	366 100

F = Frequency, % = Percentage
$X^2 = 26.445$, df = 11 $p<0.05 = 0.006$
Source: authors' fieldwork, 2017

The availability of pipe-borne water is another issue that is of significance in the study area. The decisive majority of respondents confirmed the situation to be truly dramatic in this respect, as shown in Table 3. According to the findings, only 4.5% of the respondents indicated that public pipe-borne water was available in Ilorin West Local Government. The remaining 95.5% of the respondents were of the opinion that public pipe-borne water was not available in the study area. As a matter of fact, it can be established that accessibility to public pipe-borne water in Ilorin West Local Government does not actually guarantee regular water supply. This situation therefore requires urgent and drastic attention to ensure that inhabitants of Ilorin West Local Government do not suffer from inadequate water supply they are subjected to.

Table 3. Availability of pipe-borne water in the study area

Political ward		Pipe-borne water availability		Total
		Available	Not available	
Adewole	F	9	17	26
	%	34.6	65.4	100
Ajikobi	F	0	49	49
	%	0.0	100	100
Baboko	F	0	16	16
	%	0.0	100	100
Badari	F	0	27	27
	%	0.0	100	100
Balogun Alanamu	F	4	78	82
	%	4.9	95.1	100
Magaji Ngeri	F	4	37	41
	%	9.8	90.2	100
Oloje	F	0	20	20
	%	0.0	100	100
Ogidi	F	0	22	22
	%	0.0	100	100
Ojuekun/ Zarumi	F	0	36	36
	%	0.0	100	100
Oko-Erin	F	0	25	25
	%	0.0	100	100
Ubandawaki	F	0	19	19
	%	0.0	100	100
Warrah/Egbejula	F	0	19	19
	%	0.0	100	100
Total	F	17	365	382
	%	4.5	95.5	100

F = Frequency, % = Percentage

$X^2 = 69.239$, df = 11 $p<0.05 = 0.000$

Source: author's fieldwork, 2017.

The chi-square statistics computed for the analysis of distribution of the respondents by pipe-borne water availability in Ilorin West Local Government shows that there is a statistically significant difference in their distribution across the selected political wards in the study area at $p<0.05$ confidence level ($X^2 = 69.239$, df = 11 $p<0.05 = 0.000$).

Table 4 shows the daily water consumption by the household in the study area. Accordingly, 0.6% and 3.0% of the respondents mentioned the fact that they consumed 50 liters and less and between 51 and 100 liters daily, respectively, while 7.0%, 36.5% and 52.9% of the respondents indicated that the amount (liters) of water they used daily is 101-150 liters, 151-200 liters; and 201 liters and above, respectively, regarding the study area.

Table 4. Daily water consumption by household

Political ward		Liters of water used daily					Total
		<50	**51-100**	**101-150**	**151-200**	**> 201**	
Adewole	F	0	0	0	13	13	26
	%	0.0	0.0	0.0	50.0	50.0	100
Ajikobi	F	0	7	0	18	18	43
	%	0.0	16.3	0.0	41.9	41.9	100
Baboko	F	0	0	0	4	8	12
	%	0.0	0.0	0.0	33.3	66.7	100
Badari	F	0	0	0	15	12	27
	%	0.0	0.0	0.0	55.6	44.4	100
Balogun	F	0	1	9	25	38	73
Alanamu	%	0.0	1.4	12.3	34.2	52.1	100
Magaji Ngeri	F	0	1	4	10	18	33
	%	0.0	3.0	12.1	30.3	54.5	100
Oloje	F	0	0	0	7	12	19
	%	0.0	0.0	0.0	36.8	63.2	100
Ogidi	F	1	0	1	2	12	16
	%	6.3	0.0	6.3	12.5	75.0	100
Ojuekun/	F	0	0	5	12	14	31
Zarumi	%	0.0	0.0	16.1	38.7	45.2	100
Oko-Erin	F	0	0	1	8	16	25
	%	0.0	0.0	4.0	32.0	64.0	100
Ubandawaki	F	0	0	3	4	1	8
	%	0.0	0.0	37.5	50.0	12.5	100
Warrah/Egbejula	F	1	1	0	2	12	16
	%	6.3	6.3	0.0	12.5	75.0	100
Total	F	2	10	23	120	174	329
	%	0.6	3.0	7.0	36.5	52.9	100

F = Frequency, % = Percentage
$X^2 = 97.490$, df = 44 $p<0.05 = 0.000$
Source: authors' fieldwork, 2017.

The highest proportion of respondents (52.9%) in the study area clearly opined that they consumed more than 201 liters of water every day. This implies that water consumption in the study area, in terms of drinking and domestic uses is very high. This situation portends danger to them since public pipe-borne water is not readily available. The additional effects may result from drought (water scarcity), a situation that poses threat to the inhabitants' healthy living.

The chi-square statistics calculated for the analysis of distribution of the respondents by water consumption in Ilorin West Local Government shows that there are statistically significant

differences in their distribution across the selected political wards in the study area at $p<0.05$ confidence level ($X^2 = 97.490$, df = 44 $p<0.05 = 0.000$).

5.3. Intra-urban variations in the functionality of public pipe-borne water in Ilorin West Local Government

In this subsection, a hypothesis was tested to examine statistically significant differences in the functionality of public pipe-borne water in Ilorin West Local Government. Analysis of Variance (ANOVA) was used to analyze the data obtained. The data used were the number of pipe-borne water installations that are functioning and those that are not functioning. Table 5 clearly explains this information.

Table 5. Intra-Urban variations in the functionality of public pipe-borne water

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Pipe borne water Functioning	Between Groups	63.008	11	5.728	2.702	.004
	Within Groups	216.229	102	2.120		
	Total	279.237	113			
Pipe borne water Not Functioning	Between Groups	27.118	11	2.465	1.804	.065
	Within Groups	120.242	88	1.366		
	Total	147.360	99			

Source: authors' computation, 2017

Table 5 shows Analysis of Variance (ANOVA) of intra-urban variations in the functionality of public pipe-borne water in the study area. Concerning the functioning public pipe-borne water installations, the F- ratio of 2.702 was observed to have yielded p-value of 0.004. This implies that there are significant variations in the functioning of public pipe-borne water in the study area. The inference that can be made here is that the functioning level of public pipe-borne water across the 121 localities that make up twelve political wards in Ilorin West Local Government is statistically different. The situation in each of these localities is not the same. These variations were described earlier in this chapter using frequency counts.

On the contrary, Analysis of Variance (ANOVA) of variations in the non-functioning of public pipe-borne water reveals F-ratio to be 1.804 and p-value of 0.065. It is therefore observed

that there are no significant variations in the non-functioning of public pipe-borne water in the study area. The implication of this is that the non-functioning level of public pipe-borne water across the 121 localities that make up twelve political wards in Ilorin West Local Government is statistically not different. The situation of non-functioning in each of these localities is actually the same. This finding manifests itself on the premise that there is no locality that does not recorded non-functioning of public pipe-borne water – a situation that portends threat for the residents of the examined area.

6. Policy Issues and Conclusion

This study has extensively researched into the residents' access to public pipe-borne water in Ilorin West Local Government Area of Kwara State. Its findings show that dramatically high percentage of the respondents were of the opinion that public pipe-borne water is not available. The highest proportion of the respondents (52.9%) clearly opined that they consumed more than 201 liters of water every day in the study area. This implies that water consumption in the examined area, in terms of drinking and domestic uses is very high. The study also revealed significant variations in the functioning of public pipe-borne water installations in the study area. Based on the major findings in the study, it is recommended that the government should ensure regular water supply to the existing public pipe borne-water standing points in this area. This will undoubtedly improve the present situation and will meet the residents' daily needs for water consumption and domestic use, which continue to increase day by day.

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Ocena zaopatrzenia społeczeństwa w wodę pitną w rejonie Ilorin West w stanie Kwara w Nigerii

Streszczenie

W artykule dokonano oceny dostępu mieszkańców do publicznej sieci wodociągowej w rejonie Ilorin West Local Government w stanie Kwara w Nigerii. Autorzy przeanalizowali przestrzenną dystrybucję i funkcjonalność publicznej wody wodociągowej. Zbadali również różnice wewnątrzmiejskie w rozmieszczeniu publicznych wodociągów na badanym obszarze. W badaniu wykorzystano dane pierwotne, które uzyskano poprzez losowanie 400 gospodarstw domowych, którym przekazano kwestionariusz badania. Fizyczne wyliczenie zostało również przyjęte w celu identyfikacji funkcjonalnych i niefunkcjonalnych publicznych punktów poboru wody z rur. Statystyki opisowe w postaci tabeli częstotliwości oraz wartości chi-kwadrat zostały wykorzystane do opisania popytu mieszkańców i dostępności publicznej wody pitnej. Analiza wariancji (ANOVA) została wykorzystana do zbadania różnic wewnątrzmiejskich w funkcjonalności publicznej wody rurowej. Wyniki ujawniły, że wodociągi z publiczną wodą pitną przebiegały przez różne miejsca w dwunastu okręgach administracyjnych, z których składa się samorząd lokalny Ilorin West. Chociaż zaobserwowano, że najwyższy odsetek (60,24%) publicznych punktów poboru wody wodociągowej funkcjonuje, to znaczna ich część (39,26%) nie działała. Najwyższy odsetek (95,5%) respondentów uważał, że publiczna woda z rur nie jest regularnie dostępna. Wyniki analizy wariancji (ANOVA) ujawniły istotne różnice ($F = 2,702$, $p = 0,004$) w funkcjonowaniu publicznych elementów infrastruktury wodociągowej istniejących na badanym obszarze. Badanie kończy się sugestią, że rząd musi zapewnić regularne publiczne zaopatrzenie w wodę, aby zaspokoić codzienne potrzeby mieszkańców związane z konsumpcją wody i użytkowaniem domowym, które z każdym dniem wzrastają.

Słowa kluczowe: woda pitna publiczna, dystrybucja wody.