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Effect of Non-Revenue Water on the General Functioning of the Water Utility in Doka District of Kaduna North LGA, Kaduna State, Nigeria

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Abstract:- Effect of Non-Revenue Water (NRW) on the general functioning of Water Utility in Doka District of Kaduna North LGA, Kaduna State. Questionnaires and Key Informant Interviews (KII) were administered using purposive sampling technique, inventory of bursts/ leakages were taken over the period of the study within the study area, To estimate the range non-revenue water has affected the general functioning of the water utility in Doka District was gotten from a combination of data collated from the administered questionnaires and responses from KII and review of Kaduna State Water Cooperation (KADSWAC) documents on NRW, Focused Group Discussions (FGD) was the instrument used for government; (Kaduna State Water Regulatory Commission). Results shows that plumbing materials to fix bursts and leakages which contributes highly to NRW is inadequate to the tune of about 70%, the frequent bursts/leakages was as a result of aging infrastructure and vandalism The extent to which NRW has negatively impacted KADSWAC was between 70-76% loss in revenue that would have been generated from water supplied to customers.

Keyword:- *Effect, Non-Revenue Water, Overall performance, Water Utility and Doka District.*

I. INTRODUCTION

Water amounts to around 66% of the entire earth surface yet it is woefully constrained in its accessibility as a freshwater to man. The accentuation is on freshwater assets since it is freshwater assets that are utilized for drinking, agrarian and manufacturing purposes. As per Hu, (2006), freshwater establishes just about 2.5 percent of the all water accessible on earth. What's more, even with this, it is just about 1.2 percent which is promptly accessible to be gotten to and utilized by man (Figure 1.).

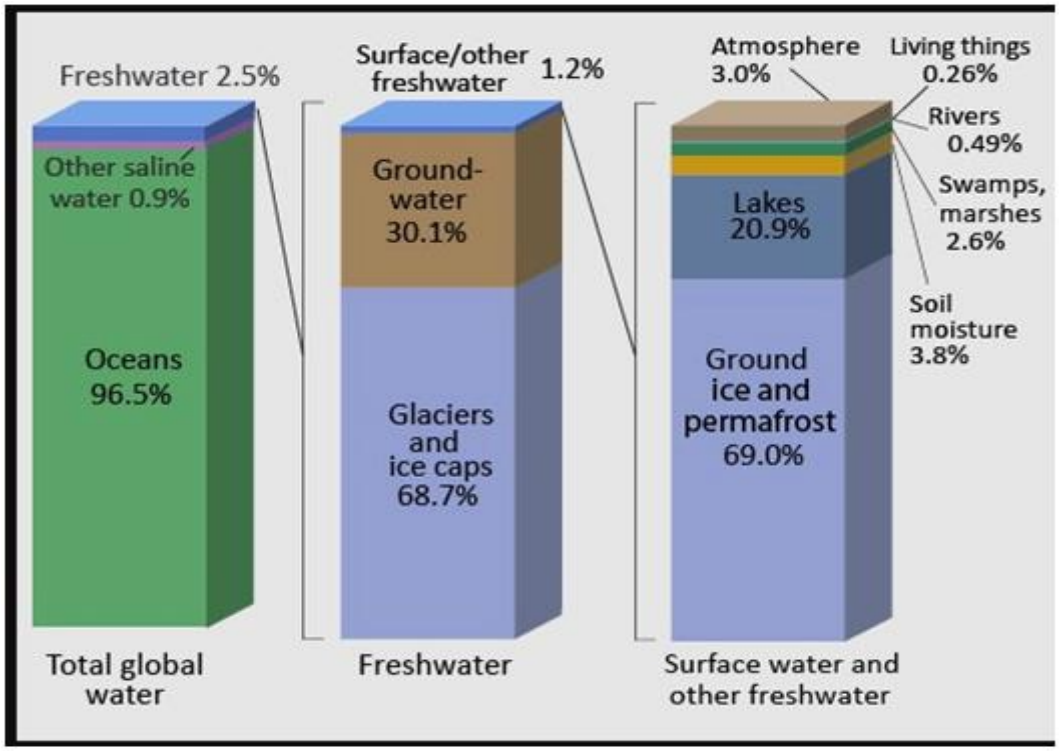

Fig 1:- Global Water Distribution
Source; https://water.usgs.gov/edu/earthwherewater.html (Assessed 23/04/2018)

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Water in satisfactory amount assumes a major aspect in the wellbeing, cleanliness and progress of a society (Kamani et al., 2012). The use for water is expanding steadily on the planet because of increments in populace, urbanization, agrarian activities and industrialization (Mathur and Vijay, 2013). The rise in water usage conjoined with losses due to Non-income Water (NRW) is causing a dilemma in satisfying water needs for all contending users of water (Kamani et al., 2012). Water assets are under worry because of developing populace and environmental change, prompting a move towards the execution of non-revenue water decrease programs in many nations around the world (Kanakoudis and Muhammetoglu, 2014). It is normal that by 2030, 47 % of the total populace will live in areas with serious water pressure (González-gómez et al., 2015). About 1.6 million kids younger than five years loss their lives as a result of contamination brought by inadequate water supply throughout the world (WHO, 2003; UNICEF/WHO, 2006).

Al-omari (2013), expressed that decrease of NRW is one of the strategies in adjusting to environmental change in utilities where the NRW is high. The turn of events and execution of powerful non-revenue water decrease techniques is significant for water utilities in satisfying the water need (Souza and Costa, 2014). As indicated by forecasts done by the Organization for Economic Cooperation and Development (OECD) in 2008, the world water utilization will ascend from 4,085 km^3 as at 2000 to 6,275 km^3 in 2050 (González-gómez *et al*,2015)

Water loss happens in all water systems, however the volume of water lost changes, and is a function of the piping grid and other nearby factors (WHO, 2001). Non-revenue water is characterized as the distinction between net water contributed to the conveyance framework and charged approved utilization. A typical range for NRW in Europe is between 7 % – 30 % while in most developing nations this is commonly high ranging from 20 % - 90 % with Lagos, Nigeria having the most noteworthy NRW at 90 % (Jayaramu and Kumar, 2014).

As indicated by Kanakoudis et al. (2015), around 30 x 10^6 l/day of water comprehensively conveyed to the consumer isn't invoiced because of illegal pipe connections, exploitation by the utility staff and absence of metering. Most evolving nations face difficulties in the administration of the non- revenue water as a result of absence of good executable NRW methodologies. (Mathur and Vijay, 2013). Water delivery in the vast majority of the African urban areas is unsuitable because of high water losses and wasteful aspects in the administrative framework (Sharma and Vairavamoorthy, 2015). High NRW affects the day to day cost of running the water utility and low income revenue generation influence the budgetary execution of water utilities in Africa (Dighade et al., 2015).

Aside from man's actions and mentality towards freshwater asset, it ought to be noticed that water can't be made and consequently the choice left to man is the productive and sustainable utilization and access to freshwater assets. (Global Water Partnership GWP,2002).There is additionally the issue of catastrophic events as flooding, dry spells and environmental change which again may have genuine negative results on freshwater assets. These events further diminish the accessibility of freshwater asset to man. People may have almost no influence over a portion of these events that influence freshwater assets, particularly climatic changes. (IPCC, 2014).

The significance of every one of these components is the requirement for reasonable and sustainable measures to be taken in the utilization and the preservation of freshwater assets. This would not just guarantee the constant accessibility of the asset yet additionally guarantee the productive utilization of assets and decrease the cost associated with the administration of water supply. In accordance with these goals, (Asit, 2014) during the most recent couple of decades, specialists in the water resources management have propounded different strategic systems that would guarantee both the productive use and supportability of the asset. A portion of these strategies are; Integrated Water Resource Management, Water Demand Management, Cost Recovery, Demand Driven Approach in the supply of water and sanitation schemes, Public Private Participation (PPP), and Community Involvement. The aim of this research is to establish the effect of non-revenue water (nrw) on the general functioning of water utility in the study area.

II. THE STUDY AREA

The Kaduna metropolis is situated in an eco-friendly zone commonly depicted as the Northern Guinea Savanna. It has been customarily portrayed by a mono-modular precipitation order and a flourishing time of 150 - 180 days for plants. It lies between latitudes $10^0$and 11^0N and longitude 7^0 and 8^0E.

Kaduna state is comprised of 23 Local Government Areas (L.G.As). Be that as it may, the Kaduna city is fundamentally a creation of urban Local Government of Kaduna North, Kaduna South, some portion of Chikun and Igabi L.G.As (Figures 2).

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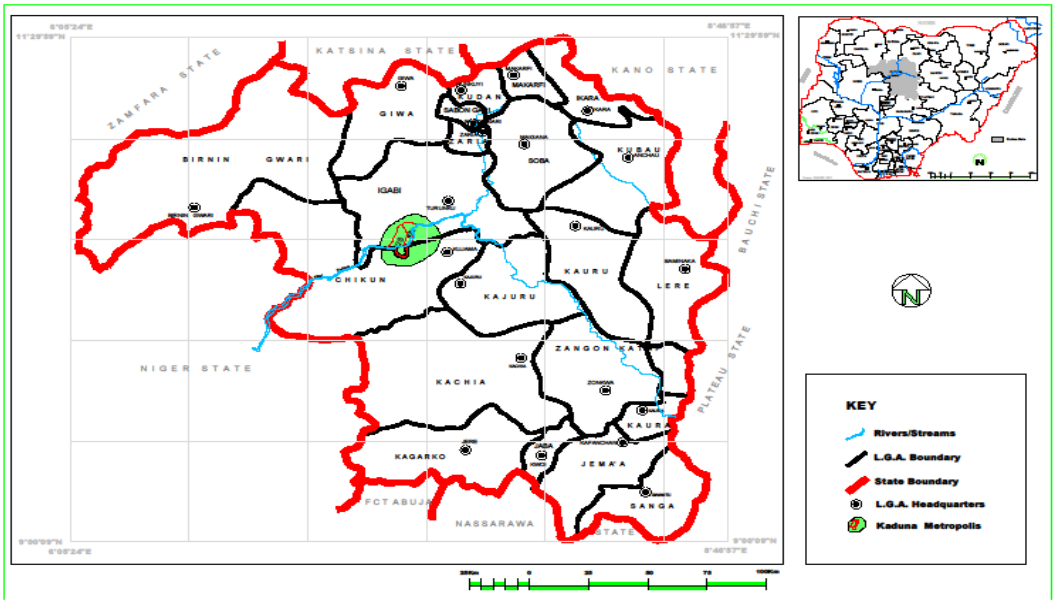

Fig 2:- Location of Kaduna Metropolis
Source: KADGIS 2018

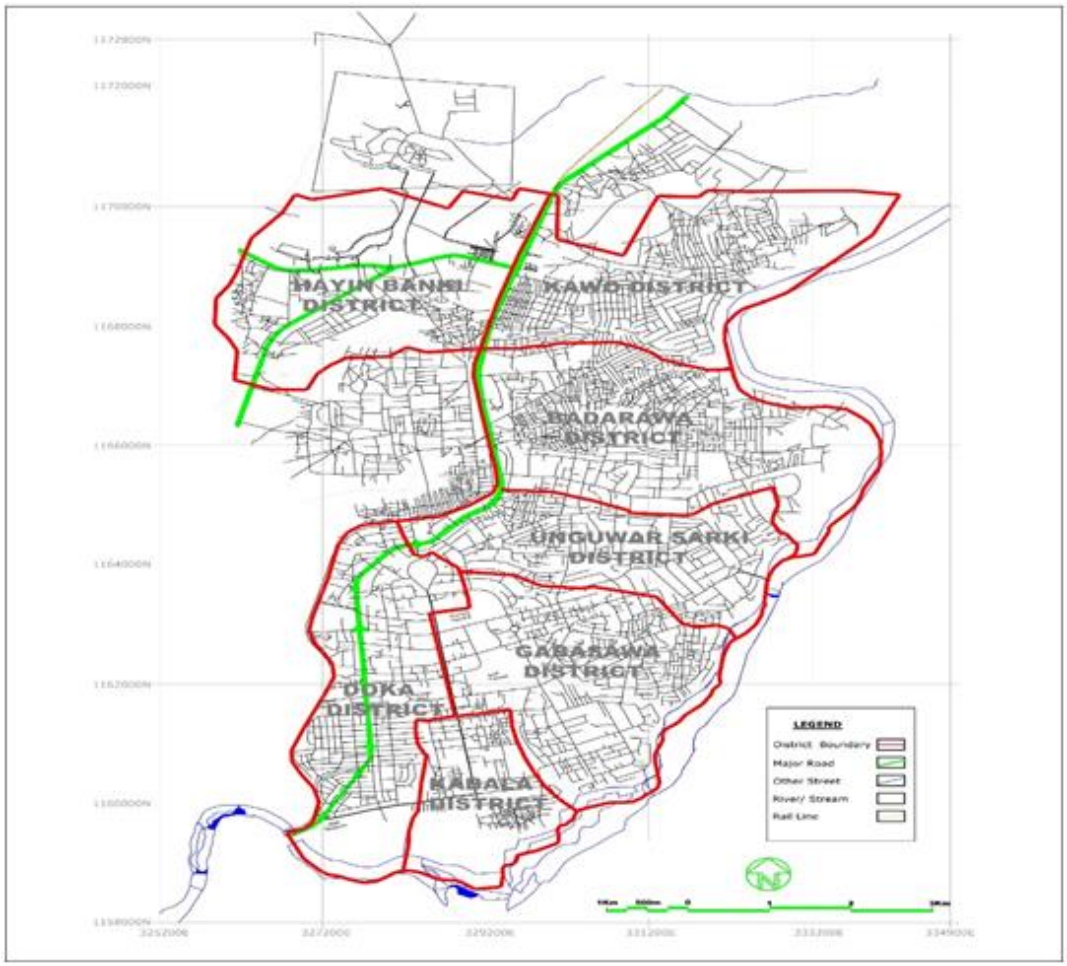

Fig 3:- The Seven Administrative districts of Kaduna North L.G.A.
Source; KADGIS, 2018

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Kaduna metropolis is made up of 21 administrative districts in the 4 local government areas (L.G.As) of Kaduna North, Kaduna South, part of Chikun and Igabi L.G.As. However, the Kaduna North L.G.A comprises of 7 districts namely; Hayin Banki, Kawo, Badarawa, Unguwar Sarki, Gabasawa, Kabala and Doka districts (Figure 3).

Doka district is the headquarters of Kaduna North Local Government Area, it is located between latitudes 10°32'34.74" North of the equator and 7°25'45.65" East of the Greenwich meridian (Figures 1.4). Situated within the Kaduna metropolis, Doka district has a total land area of about 7.5 on an elevation of 528m above sea level with its coordinates a 9°55'0"N and 7°22'45.60"E. It has a population of 139,494 (National Population Commission, NPC 2006), with a projected population growth estimate of 2.55% in every five years (National Bureau of Statistics, NBS).

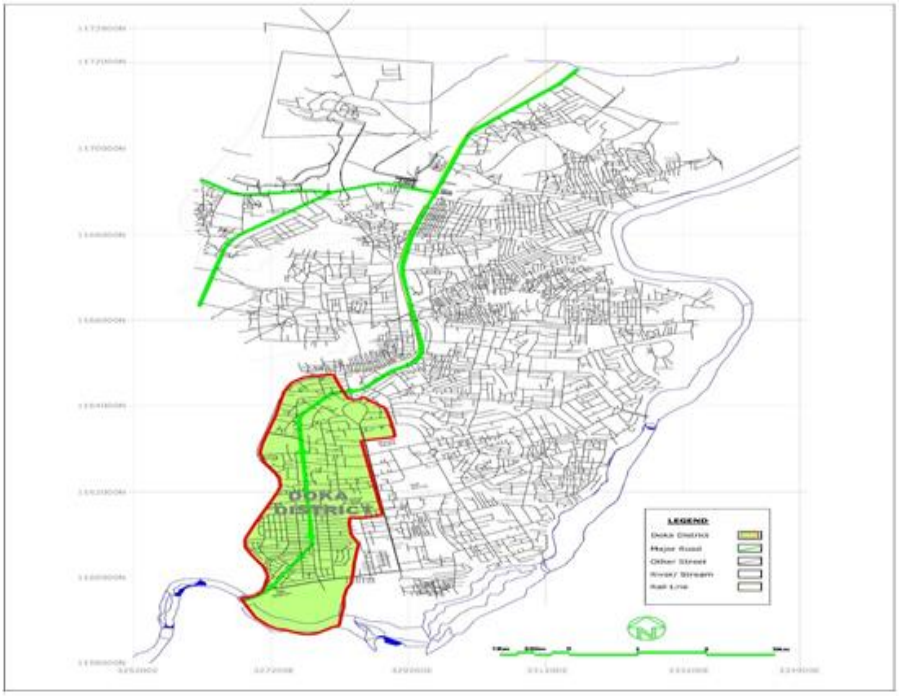


Fig 4:- The Doka District of Kaduna North L.G.A.
Source; KADGIS, 2018

III. METHODOLOGY

The research was carried out using primary and secondary sources of data. The data obtained were both qualitative and quantitative.

The primary source of data included;

- Key Informant Interviews (KII) with the Directorate Cadre of Kaduna State Water Corporation (KADSWAC).
- Administering of questionnaires to technical, commercial and administrative officials of KADSWAC
- Focus Group Discussions (FGD) with officials of Kaduna State Water Regulatory Service Commission

The secondary source of data were obtained from Corporate Planning Department of KADSWAC; they included;

- Documents on efforts used by KADSWAC to reduce Non-Revenue Water including inventory of bursts/leakages of pipes.
- Customer complaints/ suggestions of Doka District with regards to NRW.
- Literatures, journals, textbooks, handbooks, manuals and internet.

The researcher adapted purposive sampling technique to get the required information for the study. This is a non-probability sample that is selected depending the features of the population and the objective of the study. The target population are the administrative, commercial and the technical staff of KADSWAC, the officials of Kaduna State Water Regulatory Service Commission and cstomers of KADSWAC within the study area.

The sample frame of the study utilized 5% of the total staff of KADSWAC of nine hundred and eight seven (987) Gert (2013). A sample for data collection was drawn by administering fifty (50) copies of the instrument questionnaire Barlett et al., (2001) under the supervision of the Head of personnel sharing out twenty five (25) copies to the technical department officials, fifteen (15) copies to the commercial department officials and ten (10) copies to the administrative department officials of KADSWAC.

The Key Informant Interview respondent were with the Managing Director and other nine (9) Directorates of KADSWAC (Appendix II)

(Appendix II)

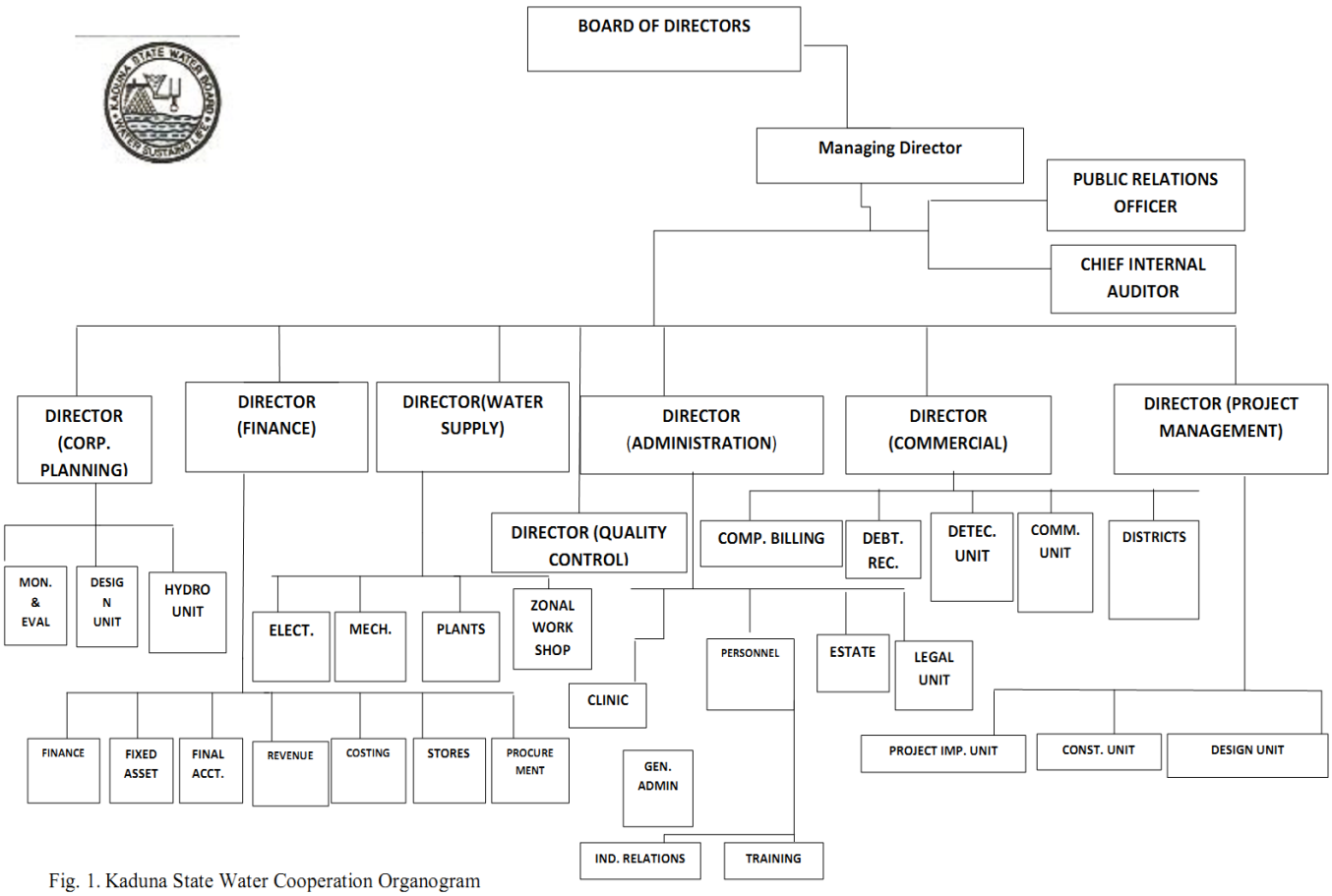


Fig. 1. Kaduna State Water Cooperation Organogram

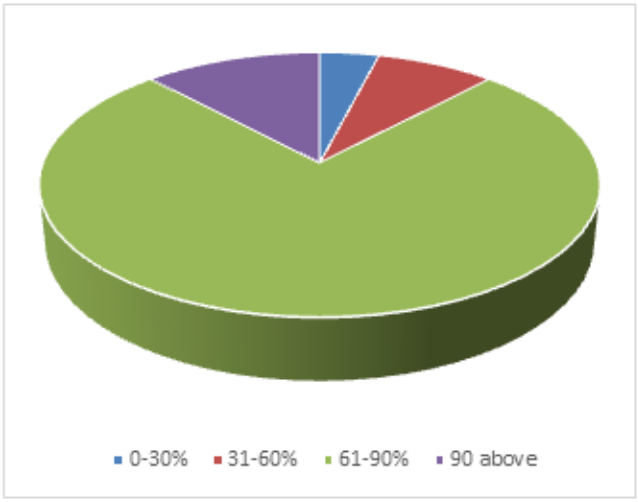
Fig 5:- Kaduna State Water Cooperation Organogram
Source; Field Survey, 2018

FGD and KII were granted to the staff of Kaduna State Water Regulatory Service Commission and the Directorate cadre of KADSWAC respectively to assess the extent NRW has impacted on the general functioning of the water utility.

The data were summarized with the use of descriptive statistics such as frequencies, percentages, tables, graphs. Furthermore, Microsoft Excel program was used for drawing charts with multiple responses so as to simplify interpretation of the data collected

IV. RESULTS

According to data obtained from the questionnaire it showed that the impact of NRW on the general functioning of the water utility has it at 61 - 90% (Figure 6), this implies that the effect of NRW on the water utility is about 76%. This was further confirmed from the KII conducted which put the impact of NRW to KADSWAC at about 70%. This negates the acceptable level of NRW in a water utility which is 25% according to the research of Farley *et al.* (2008) where conclusions were drawn from his work on understanding water losses.



	Frequency
0-30%	2
31-60%	4
61-90%	38
90% above	6

Fig 6:- Impact of NRW on Water Utility
Source: Author's Fieldwork 2018

According to Kingdom (2006) the impact of NRW on water utilities for some selected countries has it as; Germany is operating at 7% NRW, United Kingdom at 5% and Japan at 10%. This is to show that when proper management of NRW is carried out, the acceptable minimum standard of 25% according to International Water Association (2003) can be reduced further.

V. CONCLUSION

The research objective was accomplished and the outcome depicted that the present general functioning of the water utility in Doka District if far from optimum. While there is proof to acknowledge the way that there is significant levels of NRW in the water utility, the figures being cited are a greater amount of estimations than genuine figures which resulted from non-metering of consumers. It was again discovered that the present techniques being enforced by KADSWAC to address NRW levels are uneven in that most attempts are channeled to minimize real losses, specifically bursts/leakages. Such loped-sided approach towards NRW can't accomplish a lot.

The authorities of KADSWAC should carry out informative plans to sensitize the populace and relevant stakeholders about the NRW status of the water utility and modalities being enforced to curb the impact. This shall be carried out by appealing for the participation of the populace by sensitizing them on the importance of high NRW to the delivery of water to its consumers instead of only reading out disciplinary actions that would befall those who are found carrying out dealings that increases the level of NRW in the utility.

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