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Water Treatment System Consumed by the Population of the Neighborhood Cacesse Zone 2 in the Municipality of Cambambe, Province of Cuanza Norte, in the Period from January to October 2020

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ABSTRACT

The provision of drinking water is increasingly an essential element for the development of societies, not only because it is indispensable for the health and well-being of populations, but also because of its implications in terms of economic and social development, with the objective of Knowing the Water Treatment System consumed by the population of the Cacesse Zone 2 Neighborhood, in the Municipality of Cambambe in the Province of Cuanza Norte in the period from January to October 2020. An Observational descriptive and analytical study was carried out, using a qualitative-quantitative methodology to collect data, of the 300 residents, 32% (95 residents) are male, and 68% (205 residents) are female, 42% (127 residents) say that fountains/probes are the main sources of water supply, 53% (158 residents) say that the regularity in the water supply is every other day, 92% (275 residents) say that buckets and basins are the main systems water storage for consumption, 60.4% (181 residents) stated that they do not treat water for consumption, 72% (217 residents) responded that the streets are the main places used for the disposal of wastewater by neighborhood, 65% (195 residents) are dissatisfied with the level of satisfaction with water distribution services.

Keywords: Water treatment, Supply, Water quality and Population.

INTRODUCTION

The provision of drinking water is increasingly an essential element for the development of societies, not only because it is indispensable for the health and well-being of populations, but also due to its implications in terms of economic and social development. Angola has exceptional water potential, but this natural resource is unevenly distributed and, as a result of population growth, has been suffering pollution and degradation that increasingly compromise its availability. In recent years (2002–2017), several investments have been made in the water sector; however, the levels of water supply and sanitation coverage are still unsatisfactory. Overall, available water resources have been underutilized to meet the needs of the population (PAT, 2018).

The "Water for All" Program was created in July 2007 through Resolution No. 58/07 of the Council of Ministers, with the aim of ensuring water supply to 80% of the rural population of Angola. The issues in the water supply and sanitation sectors in municipalities reflect the general situation of most Angolan cities. The water supply and sanitation infrastructures have not kept pace with the growth of the population and the cities (*Ibidem*).

Irregularities in water supply and lack of access to the public network lead the population to seek alternative sources. Wastewater sanitation services favor the urbanized areas in city centers, to the detriment of peri-urban areas where most of the population lives. The wastewater sanitation system is based on discharging effluents

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into stormwater drainage networks without any prior treatment or into septic tanks; as alternatives, streets and watercourses are also used (PAT, 2018).

This situation favors the pollution of water resources and the environment in general, with the destruction of riparian ecosystems and high rates of diseases and deaths related to the consumption of contaminated water and lack of basic sanitation. This work analyzes the implications of insufficient water supply and wastewater treatment for the health of the population and the environment.

In this context, we identified the following research objective: To understand the water treatment system used by the population of Cacesse Zone 2, in the Municipality of Cambambe, in the Province of Cuanza Norte.

Stages of Water Supply

Protecting human health should be the primary objective of a water supply system for human consumption (Jalba *et al*., 2010). Any water, whether surface or groundwater, requires prior treatment before consumption to ensure that it poses no danger to human health. The dangers for consumers of poor-quality water stem from possible microbiological, chemical, physical, or even radioactive contamination (WHO, 2012). Most treatment systems are designed to remove microbiological contaminants and components that affect water acceptability or promote microorganism survival, often associated with suspended solids in the water. Disinfection is also present in almost all types of treatment systems, regardless of their size or complexity.

This occurs for several reasons: firstly, to inactivate bacteria that may still be present at the final stage of treatment, and more importantly, to ensure a residual disinfectant level remains to eliminate any bacteria introduced during storage or distribution. Currently, there is a wide range of treatment systems available, applied according to the water quality at the source (WHO, 2012).

Water source for human consumption

Water can be classified according to its origin into surface and groundwater. Surface waters are sourced from rivers, lakes, and reservoirs. Rivers exhibit significant fluctuations in water quality, especially when seasonal changes occur, and are also more susceptible to contamination from pollutants. In contrast, lakes and reservoirs primarily face issues such as stratification in the summer and eutrophication, which in many cases can be quite pronounced. According to Rego (2004), surface waters typically present:

- ✓ High amounts of suspended materials;
- ✓ High organic load;
- ✓ Low dissolved salt content.

Groundwater tends to be:

- ✓ Hard (in limestone soils) or acidic (in granite soils);
- ✓ Clear (as it is filtered through soil layers);
- ✓ Contain dissolved chemical elements that may be more or less harmful.

The characteristics of groundwater vary depending on the type of soil it interacts with. The presence of chemical contaminants, such as nitrates, detergents, or heavy metals, is primarily a result of agricultural or industrial activities nearby (Rego, 2004).

Water supply and sanitation services in Angola

Before independence, water management was distributed among various state bodies. In most district capitals (such as the Municipality of Cazengo), cities, and other urban centers, the operation and management of water supply systems were the responsibility of the respective Municipal Councils (Van-Dúnem, 2003: 190). After

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independence, the water sector passed through various supervisory bodies, from the Ministry of Construction and Housing (MCH), which was responsible for carrying out rehabilitation works, to the Ministry of Energy and Water (MINEA) (Ventura & Jacinto, 2014).

At the provincial level, MINEA has Provincial Directorates of Energy and Water and Municipal Administrations, through departments responsible for water supply and sanitation or through municipal energy and water brigades (Adra & UNICEF-Angola, 2016). The complementarity between water supply and wastewater treatment has, in general, not been adequately addressed, as almost no treatment is done on wastewater before it is returned to nature, which could jeopardize public health and the well-being of ecosystems. Regarding water pricing, there is no regulation, as prices are set by Provincial Governments (MINEA, 2013: 38). According to the same source:

"The participation of the private sector in water supply and sanitation is virtually nonexistent... Contributing to this situation is the lack of a clear definition of the modalities for participation, the volume of investments required at this stage of rehabilitation and expansion of systems, and the guarantee of their recovery, as well as the absence of a tariff system and a regulatory framework to ensure adequate remuneration for investments and operators" (MINEA, 2013: 43).

Access to Water and Sanitation in Angola

Access to safe drinking water and adequate sanitation services, with broad coverage levels, contributes significantly to the improvement of health and well-being among populations. In 2015, approximately 663 million people worldwide were still using unsafe water sources (such as unprotected wells and springs, and surface water). Nearly half of this number lived in Sub-Saharan Africa (UNICEF & WHO, 2015: 7). In Angola, the situation is critical, as less than 50% of the population has access to a safe drinking water source. However, there is a noticeable disparity in water supply levels between urban and rural areas of the country. According to data from UNICEF and WHO (2015: 57), around 75% of the urban population has access to safe drinking water, whereas in rural areas the figure is only 28%.

There are also disparities among the provinces in terms of access to safe drinking water. The Province of Cabinda is the best served, with 73% of the population having access. It is followed by the provinces of Benguela (59%), Cuanza Norte (57%), Malanje (51%), Zaire (51%), and Huambo (50%). On the opposite end, the provinces of Cunene, Lunda Norte, Lunda Sul, Moxico, Bengo, and Kwanza Sul have the lowest coverage, with only 23%, 27%, 28%, 28%, 30%, and 33% of the population served, respectively (INE, 2016). Luanda Province has the highest rate of well-served households, with 91%. Conversely, the Province of Cunene is far below the national average, with only 12% (INE, 2016: 72). In the Province of Huíla, the number of households with access to an adequate drinking water source and sanitation conditions is also below the national average (INE, 2016).

MATERIALS AND METHODS

This was a descriptive and analytical study, employing a qualitative-quantitative methodology for data collection.
The study was conducted in Bairro Cacesse Zone 2, located in Cambambe, Cuanza Norte Province, between January and October 2020. The sample consisted of 300 residents of Bairro Cacesse 2, situated in the city of Cambambe.

The statistical method was applied to collect, examine, organize, synthesize, and present all information using frequency measures.

To achieve the established goals, prior authorization was obtained from relevant authorities to carry out the data collection procedures with selected individuals. A questionnaire was administered to the population of Bairro Cacesse 2, in the Municipality of Cambambe, Cuanza Norte Province.

Data were collected through a survey and structured interviews that encompassed all relevant variables,

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serving as a guide for data collection. Data analysis was performed using a computer operating on Windows 8. The discussion was based on the evaluation of the objectives, supported by the available literature on the subject, reinforced by various authors, and guided by criteria defined by the researchers, which enabled the formulation of conclusions and proposals.

RESULTS

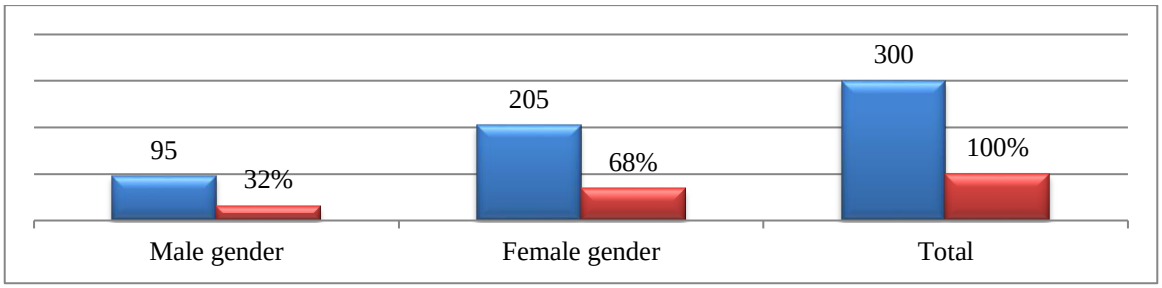

Figure 1 – Gender

Source: Prepared by the authors

According to Figure 1, out of the 300 residents, 32% (95 residents) are male and 68% (205 residents) are female.

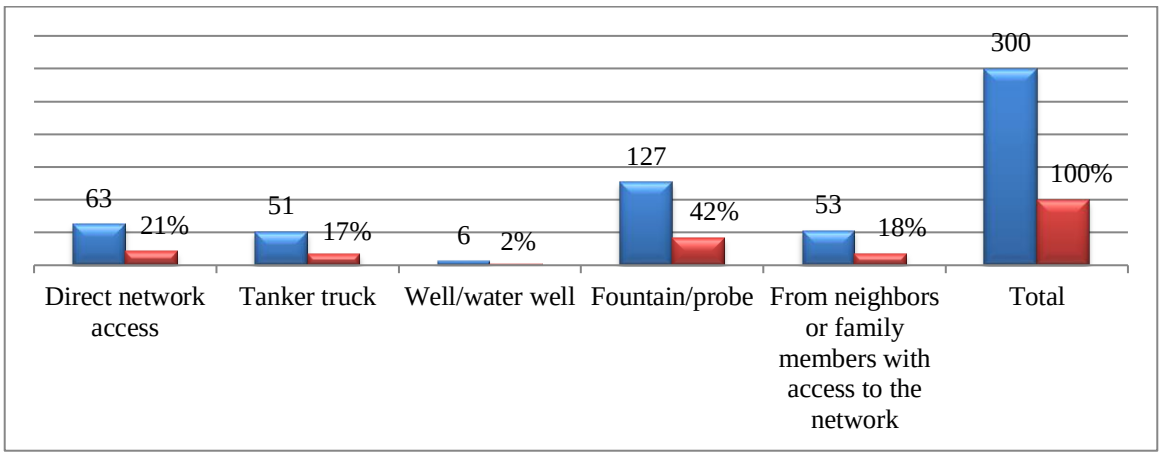

Figure 2 – Main Sources of Water Supply

Source: Prepared by the authors

Regarding the main sources of water supply, 21% (63 residents) reported having direct access to the piped water network, 17% (51 residents) indicated water delivery trucks, 2% (6 residents) mentioned wells or boreholes, 42% (127 residents) cited public taps or boreholes, and 18% (53 residents) obtain water from neighbors or relatives.

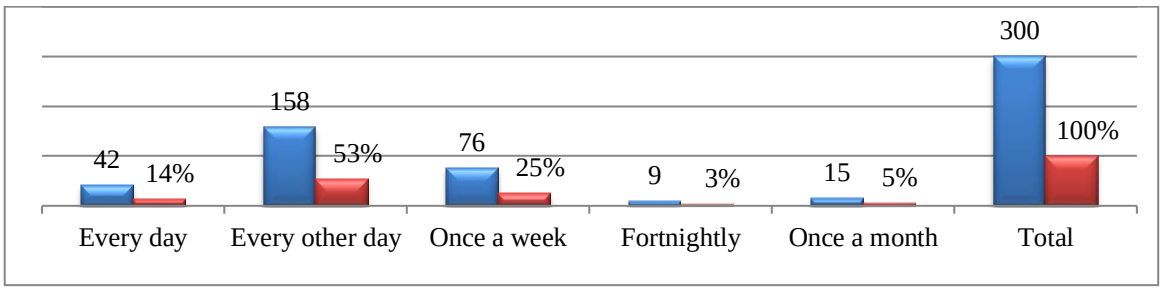

Figure 3 – Regularity of Water Supply

Source: Prepared by the authors

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In this figure, water supply regularity is distributed as follows: 14% (42 residents) receive water daily, 53% (158 residents) receive it every other day, 25% (76 residents) once a week, and 5% (15 residents) only once a month.

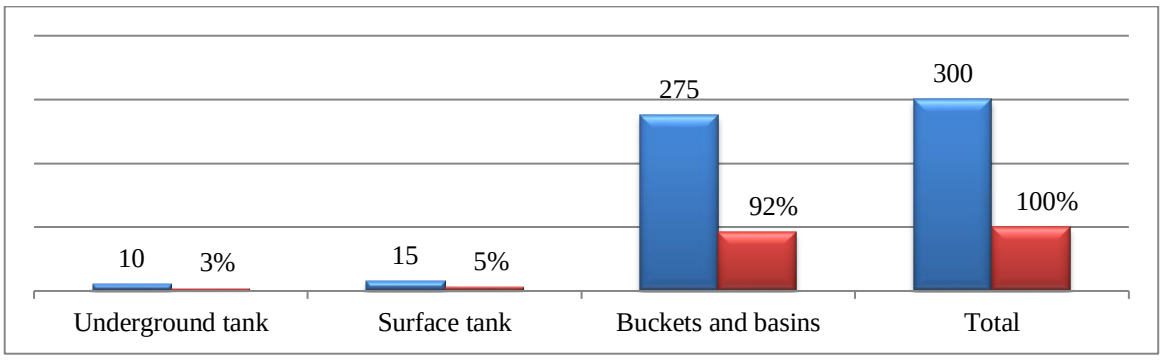

Figure 4 – Main Water Storage Methods for Consumption

Source: Prepared by the authors

According to Figure 4, 3% (10 residents) store water for consumption in underground tanks, 5% (15 residents) in surface tanks, and 92% (275 residents) in buckets and basins.

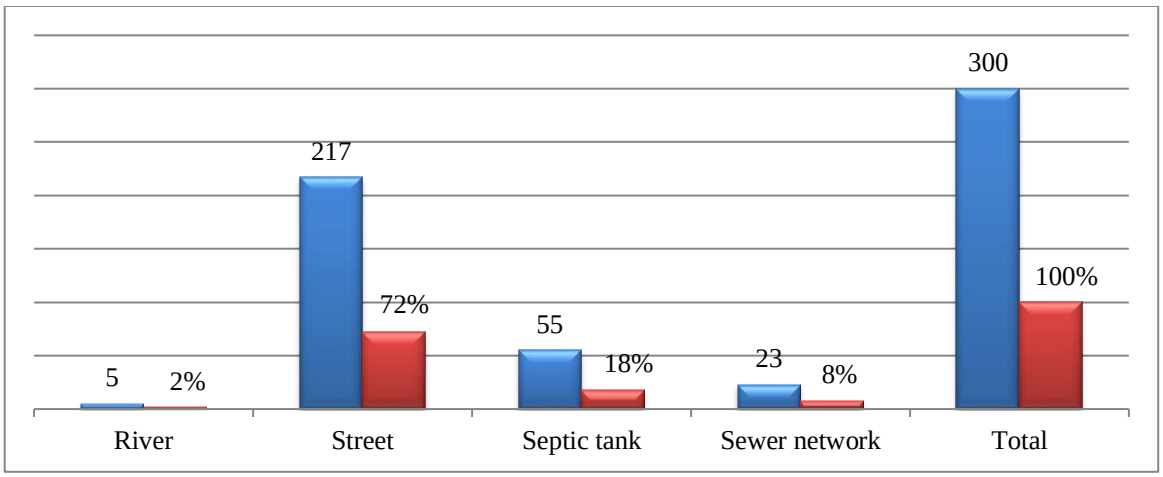

Figure 5 – Methods of Water Treatment for Consumption

Source: Prepared by the authors

With regard to water treatment for human consumption, 29.3% (88 residents) use bleach for disinfection, 10.3% (31 residents) boil the water, and 60.3% (181 residents) do not treat the water at all.

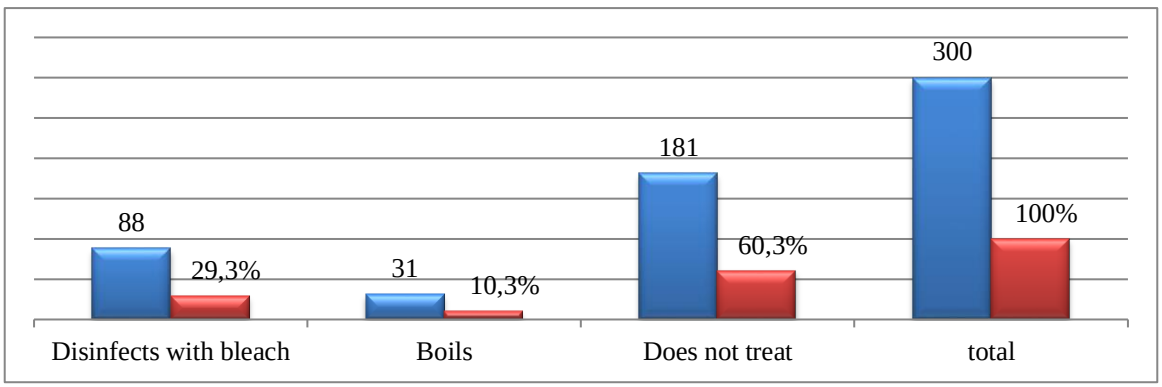

Figure 6 – Main Sites for Wastewater Disposal by Neighborhood

Source: Prepared by the authors

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Regarding wastewater disposal, 2% (5 residents) discharge it into rivers, 72% (217 residents) onto public roads, 18% (55 residents) into septic tanks, and 8% (23 residents) into sewage networks.

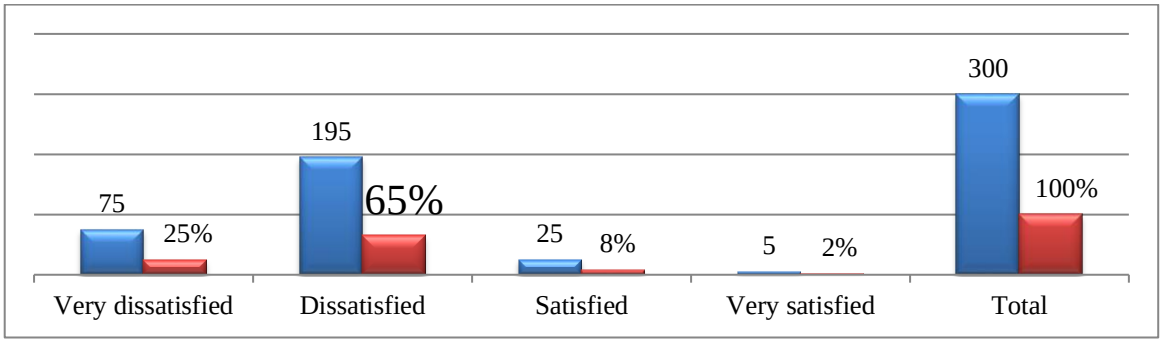

Figure 7 – Level of Satisfaction with Water Supply Services

Source: Prepared by the authors

In terms of satisfaction with water supply services, 25% of residents are very dissatisfied, 65% are dissatisfied, 8% are satisfied, and 2% are extremely satisfied.

DISCUSSION AND CONCLUSION

Out of a total of 300 residents, 32% (95 residents) are male and 68% (205 residents) are female. Among them, 42% (127 residents) identified public standpipes or boreholes as their main sources of water, while 53% (158 residents) reported that water supply is intermittent. Furthermore, 92% (275 residents) stated that buckets and basins are their primary methods of water storage for consumption. A significant portion, 60.3% (181 residents), reported not treating water prior to consumption. Additionally, 72% (217 residents) indicated that wastewater is commonly discarded in the streets.

To improve the water treatment system used by the population of Cacesse, the following suggestions are proposed:

- ✓ Construction of a water treatment facility that meets the necessary standards to improve the quality of water consumed by the local population;
- ✓ Formation of a dedicated team to oversee the basic sanitation system, aiming to prevent the population from dumping waste into the river;
- ✓ Promotion of alternative methods for household water treatment, which would help prevent the spread of various waterborne diseases;
- ✓ Development of a local policy to ensure that every resident has direct access to piped water from the public distribution network at home.

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