



Research Paper

## A Geographical Look at Water Use in An Intégré Neighbourhood: The Gbokora Neighbourhood In Daloa (Centre-West, Ivory Coast)

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**ABSTRACT:** Access to drinking water is a major issue in developing countries. It is a factor of development. Not having at least one water tap in the yard or in the home affects human capital from an economic, health and social point of view.

Faced with an ever-increasing demand for water in an integrated neighbourhood with strong spatial and demographic growth, the spatial dimension is not sufficiently taken into account in the study. This is the main interest of our study, which aims to show the socio-demographic determinants of households in the Gbokora district in relation to water use. This work was based on documentary research and a field survey. The various stages of this survey consisted of direct observations, an inventory of water supply sources and housing, a questionnaire sent to households and interviews with administrative authorities and SODECI officials. The results reveal that 47% of households use tap water, 21% prefer well water, 16% alternate between tap and well water, 5% of households use only spring water, and 5% of households use a combination of these sources (tap water plus spring water plus well water). The socio-demographic survey on water consumption in Gbokora identified 47% of men. The distribution by age group of respondents reveals that the 18 to 55 year old group accounts for 95%, followed by the over 55 year olds with a proportion of 5%. The unemployed represent 37% of consumers. In terms of housing, 74% of the buildings are made of hardwood and fenced against 16% of houses made of open hardwood (not fenced) and 11% of houses made of earth and open.

**KEYWORDS:** Gbokora, geographical perspective, use of water, household, habitat.

Received 12 Aug., 2025; Revised 22 Aug., 2025; Accepted 24 Aug., 2025 © The author(s) 2025.

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### I. INTRODUCTION

Access to drinking water is a major issue in developing countries. The water issue is far from being resolved in Côte d'Ivoire despite the efforts made to relieve the population. Cities in the interior of the country are subject to enormous difficulties in the supply of drinking water [1]. The city of Daloa unfortunately does not escape this reality.

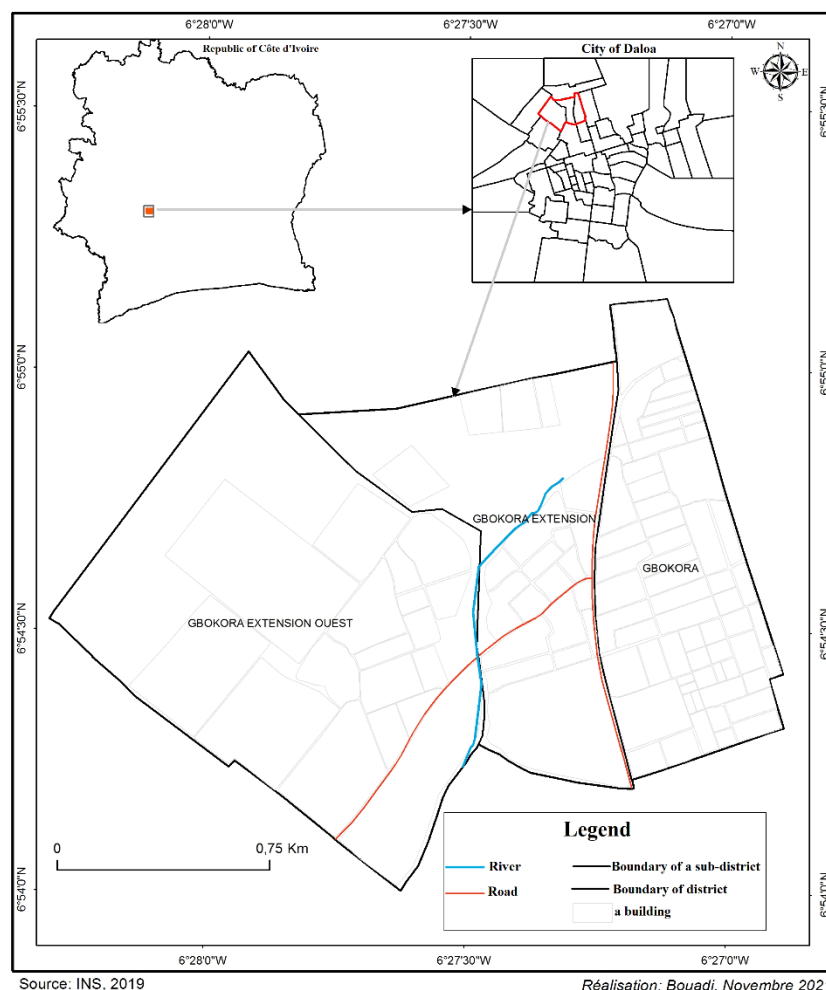
In the central-western part of Côte d'Ivoire, Daloa has been undergoing rapid spatial evolution due to strong demographic growth for more than 50 years [2]. It is in the period from 1998 to 2007 that the village Gbokora became an integrated district in the city of Daloa. This integrated village is located 3km north of Daloa, on the axis of the town of Vavoua. Its population is 1087 hbts [3]. In 2005, the district of Gbokora in the city of Daloa was attached to the water supply system of the SODECI (Société de Distribution d'Eau en Côte d'Ivoire). Notwithstanding this connection, we note an influx of well creation. The creation of a well in its environment makes it possible to answer the question of water accessibility and water cuts, in a context of generalized impoverishment of the urban population. The difficulties in supplying the population with drinking water provide the basis for a geographical approach to the issue, particularly with regard to the spatial distribution of water sources (particularly well and tap water), the use of water (cooking, washing up and laundry) and housing.

The objective of this study is to show the socio-demographic determinants of households in the Gbokora district in relation to water use. Specifically, it is to analyze the evolution of the use of the various water sources in the integrated district of Gbokora, to show the indispensable recourse of the populations to well water and the socio-demographic determinants of the households using well and tap water.

## II. MATERIALS AND METHODS

### 2.1 The characteristics of the study area

The city of Daloa is located in the Centre-West of Côte d'Ivoire. Chief town of the Upper Sassandra region, Daloa is located 141 km from Yamoussoukro, the political capital and 383 km from Abidjan, the economic capital of Côte d'Ivoire. It has 245,360 inhabitants according to the 2014 general population and housing census, with an area of 530.5 ha. It is the 3rd most populated city in Côte d'Ivoire after Abidjan and Bouaké. This city is located between 6°30' and 8° North latitude and between 5° and 8° West longitude. It has 31 districts. In its various districts, we note that households are strongly distinguished by the water used either for drinking or for washing up, etc. This phenomenon is more visible in the district of Gbokora, which constitutes our study area (figure 1).



**Figure 1:** presentation of the integrated neighbourhood of Gbokora in the city of Daloa

Located on the northern outskirts of the city, this neighborhood has experienced a meteoric growth with the creation of the multidisciplinary university Jean Lorougnon Guédé.

### 2.2 Data collection and processing

The collection of data necessary for this research was based on documentary research on the one hand, and on field investigation on the other. The documentary research was permanent throughout this study in certain structures in charge of water distribution issues, in particular drinking water, such as the SODECI (Société de Distribution d'Eau en Côte d'Ivoire). It holds the list of the various subscribers in the different districts of the city and in particular in our study area. The INS (Institut Nationale de la Statistique) has made available certain documents concerning the typology of the population of the city of Daloa by district. The compilation of data collected in these different structures was essential to understand the characteristics of the population of our study area and especially the share of the population that consumes SODECI's water. In order to fill in some of the gaps in the documentation, investigations were carried out in the study area.

The field survey was conducted in two phases during the period from May 2021 to June 2021. In May 2021, a first field trip without questionnaire was conducted, only to understand the various situations, to identify the water supply points (well water and spring water), the habits of households in case of water shortage, to get acquainted with the households, and to explain them the objective of our study.

The second phase of the survey (June 2021) consisted of interviews with the managers of the water distribution structure (SODECI) and the customary authorities. The interviews with the managers of the water distribution structure (SODECI) took place at their premises. They aimed to know the difficulties in supplying the populations in these peripheral districts with drinking water and especially to try to understand the bad reputation of the quality of this water in the city of Daloa. The interview we had with the customary authorities were invaluable. The information gathered allowed us to see how water consumption has evolved in the village of Gbokora to the present day.

The collection of data for this research was also based on the administration of a questionnaire to a "household" sample in the Gbokora neighbourhood in the city of Daloa. The questionnaire was designed to identify the socio-demographic characteristics of the respondents in the households and their economic profile. It also looked at the use of water in the households. The target population of our study was the adults present in the household at the time of the survey. Regarding the survey design, the study carried out is a survey of households in the Gbokora district in the city of Daloa. For the selection of the survey households, we used the random selection method. Our sampling frame consists of 217 households in the Gbokora district. Since we could not conduct an exhaustive survey with the sampling frame thus established, we developed a sample. We opted for a 50% sample, given the large number of actors involved. For 217 households in the Gbokora district, our calculation led us to select 109 households in the Gbokora district.

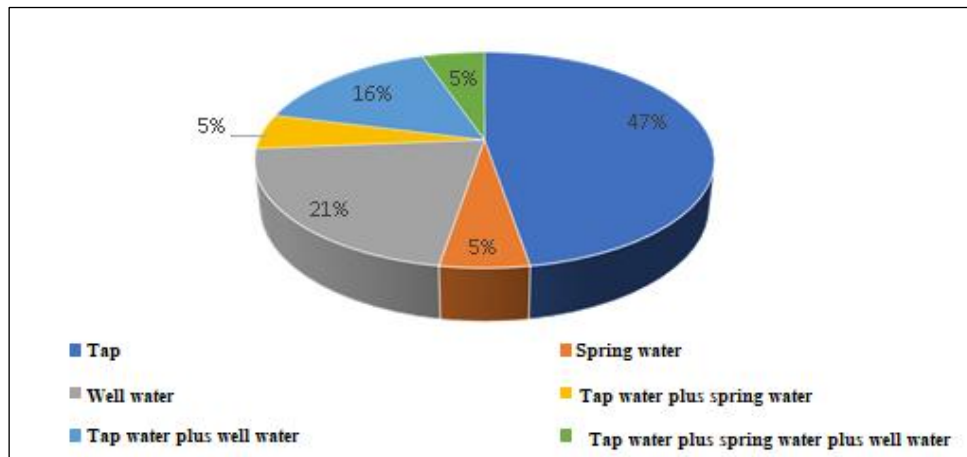
The documents consulted in the structures and the field survey data were processed manually and by computer. The data processing was carried out with Microsoft Excel software in its 2010 version. After the questionnaires were processed, a matrix was entered and a pivot table was designed from it. This table made it possible to carry out a series of cross-tabulations between the water source variable (taken as the dependent variable) and the socio-economic and demographic parameters (taken as the independent variables). This option made it possible to highlight the characteristics of households according to the water source used.

### **III. RESULTS**

#### **3.1 Analysis of the evolution of water consumption in the Gbokora district**

Since the colonial period, the drinking water sector in Côte d'Ivoire has evolved. Today, people turn on the tap and healthy water flows freely. Before 1987, this was not the case. The water for household consumption was either well water, river water, rainwater, etc., which was kept in earthenware jars. Water is a free good in its natural state. Its consumption by man in this state presents many health risks. Hence, the need to set up a drinking water supply system to produce and distribute drinking water. It is since October 1st, 1959 that the Ivorian hydraulics underwent great reforms with the creation of the SODECI (Company of Water Distribution in Ivory Coast). It had the status of an SME (Small and Medium Enterprise) which only managed water distribution in the vicinity of Abidjan. In 1973, a national water programme was initiated. It is from this moment that SODECI takes off to become one of the biggest companies in Africa in its field.

The management of the public water service was based on the French model in its development process i.e. leasing (Koukougnon, 2012). This management system is characterized by the delegation of the operation management to a private operator (SODECI) with the State as the owner of the facilities. Thus, it was in 2005 that the Gbokora district in the city of Daloa was attached to the SODECI water supply system. Today, the population of Gbokora benefits from several sources of water supply according to the surveys. These are spring water, well water, tap water and rainwater depending on the rainy season. 47% of households use tap water.



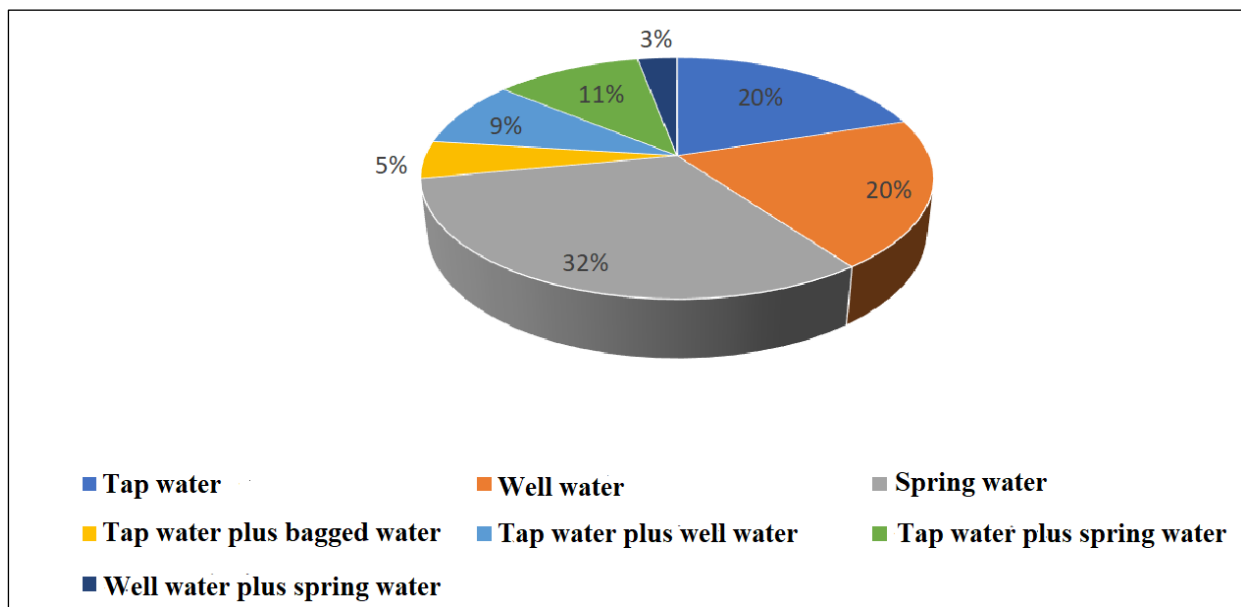
**Figure 1:** Distribution of households by water supply

21% prefer well water, 16% alternate between tap water and well water, 5% of households use only spring water and finally 5% of households combine all these sources of supply (tap water plus spring water plus well water).

### 3.2 The indispensable recourse of the populations of Gbokora to well water despite its status as an integrated village

Apart from rivers, ponds, streams etc, wells are the only source of water supply in villages in developing countries. The populations are therefore used to using well water in profusion, which they obtain free of charge for human needs (drinking, personal hygiene, washing, cleaning, etc.).

With the expansion of Daloa, this village/neighbourhood, which is integrated into the city, has not managed to abandon well water despite the connection of the neighbourhood to the SODECI water supply system. Thus, 53% of households say they have wells in their homes. For 37% of households, the wells are close to their residence, while 11% have neighbours in the neighbourhood who have a well.



**Figure 2:** Distribution of households by availability of wells

### 3.3 Socio-economic determinants of the surveyed population in Gbokora

The 109 households to whom the questionnaire was administered during the survey phase are distributed in the Gbokora district in the commune of Daloa. The socio-demographic data collected clearly describe the profile of the interviewees in terms of age, gender, level of education, income level, status in the household, marital status, source of income and family environment.

Of the 109 households surveyed, 32% were heads of household, 21% were spouses of heads of household, 21% were parents of the head of household residing in the household and 26% were children of the

head of household. In fact, it is a matter of the data collector identifying the person able to fill in the household questionnaire. Thus, we thought it relevant to distribute the respondents according to gender.

#### Gender by habitat

The socio-demographic survey on water consumption in Gbokora identified 47% of men. The proportion of women is 53%. The high number of women is explained by the fact that they are more stable in the home and use more water than men in the household, especially for preparing meals, washing dishes, laundry, etc.

#### Age range

The age distribution of the respondents reveals that the 18 to 55 age group accounts for 95%, followed by the over 55 age group with a small proportion of 5%. At the time of the survey, the youngest respondent was 20 years old.

#### Employment

The unemployed represent 37% of consumers. Next come shopkeepers with a proportion of 21%. Finally, managers (16%), farmers (11%), housewives (11%) and labourers (5%) follow.

#### By habitat

In terms of housing, 74% of the buildings are of hard standing and fenced against 16% of houses of open hard standing (not fenced) and 11% of houses of open ground.

### 3.4 Socio-demographic characteristics of households using well water

#### Socio-demographic characteristics of households using well waterFor laundry

The survey found that 50% of households using well water for washing live in fenced houses, 17% live in fenced houses, 17% live in unfenced houses and 16% live in unfinished houses without fences (Table 1).

Type of habitat	Hard without fence	17%
	In the ground without fence	17%
	Hard with fence	50%
	Unfinished without fence	16%
Number of pieces	1	17%
	2	33%
	3	33%
	5	17%
Number of people	-5	33%
	5 à 10	17%
	≥ 10	50%
Occupancy status of dwellings	Family property	83%
	Free	17%
Marital status	Widow(er)	22%
	Married	33%
	Singles	45%
Profession	Traders	17%
	Unemployed	32%
	Maneuvers	17%
	Middle management	17%
	Planters	17%

**Table 1:** Socio-demographic characteristics of households using well water for laundry

All of these houses have one room. 50% have more than 10 people in the household, 17% have between 5 and 10 people and 33% have less than 5 people (Table 1).

The survey also revealed two housing tenure statuses of the respondents in the study area (Table 1). These are family property and free housing. It can be seen that family property is the most numerous, representing 83%. We note that 17% of the respondents claim to be housed free of charge.

The distribution of households using well water for laundry according to marital status (Table 1) reveals that 17% are single and 66% are married. Respondents who are separated from their partners because of divorce represent only 17%. The majority of these respondents are unemployed (32%). 17% are shopkeepers, 17% are labourers and 17% are farmers. Only 17% were middle managers.

### **Socio-demographic characteristics of households using well water for washing up**

Among the households that use well water for washing dishes, 40% live in fenced houses, 20% live in fenced houses, 20% live in unfinished houses without fences and 20% live in unfinished houses without fences (Table 2). 20% of these houses have one room, 40% have two rooms, 20% have three rooms and 20% have five rooms. 20% of these households have more than 10 persons, 40% have between 5 and 10 persons and 40% have less than 5 persons (table 2).

Type of habitat	Land without fence	20%
	Hard without fence	20%
	Unfinished with fence	20%
	Hard with fence	40%
Number of pieces	1	20%
	2	40%
	3	20%
	5	20%
Number of people	-5	40%
	5 à 10	40%
	≥ 10	20%
Occupancy status of dwellings	Family property	60%
	Free	20%
	Rental	20%
Marital status	Divorced	20%
	Married	60%
	Celibacy	20%
Profession	Shopkeeper	20%
	Unemployed	40%
	Manoeuvre	20%
	Housekeeper	20%

**Table 2:** Socio-demographic characteristics of households using well water for washing dishes.

The survey also revealed three housing tenure statuses of the respondents in the study area (Table 2). These are family property and free lodgers and tenants. It can be seen that family property is the most numerous, representing 60%. It can be seen that 20% of the respondents claim to be living in free accommodation and 20% are tenants.

The distribution of households using well water for dishwashing by marital status (Table 2) reveals that 20% are single, 60% are married. Only 20% are divorced. The majority of these respondents are unemployed (40%). 20% are shopkeepers, 20% are labourers and 20% are housewives.

### **Socio-demographic characteristics of households using well water or the kitchen.**

Among households using well water for cooking, 25% live in hard fenced houses, 25% live in hard fenced houses, 20% live in earthen houses without fences, 20% live in unfinished houses without fences and the remaining 20% live in earthen houses with fences (Table 3).

Type of habitat	Hard with fence	25%
	Unfinished without fence	25%
	Hard without fence	25%
	Land without fence	25%
Number of pieces	1	25%
	2	50%
	3	25%
Number of peoples	-5	50%

	5 à 10	50%
Occupancy status of dwellings	Family property	50%
	Free	50%
	Rental	25%
Marital status	Married	75%
	Divorced	25%
Profession	Traders	25%
	Unemployed	25%
	Maneuvers	25%
	Households	25%

**Table 3:** Socio-demographic characteristics of households using well water for cooking

25% of these houses have one room, 50% have two rooms, and 25% have three rooms. 50% of these households have more than 10 people and 50% have between 5 and 10 people.

The survey also revealed three housing tenure statuses of the respondents in the study area (Table 3). These are family property, free housing and tenants. It can be seen that family property is the most numerous, representing 50%. It can be seen that 25% of the respondents claim to be living in free accommodation and 25% are tenants. The distribution of households using well water for cooking according to marital status (Table 3) reveals that 25% are single and 75% are married. These respondents are unemployed (25%). 25% are traders, 25% are labourers and 25% are housewives.

### 3.4 Socio-demographic characteristics of households using tap water

#### Socio-demographic characteristics of households using tap water for laundry

The survey revealed that 67% of households using tap water for washing clothes live in fenced- in houses, 22% live in fenced-in houses and 11% live in unfinished houses with fences (Table 4). 23% of these houses have one room, 33% have two rooms and 23% are three-room houses. 22% of these houses have more than 10 people in the household, 33% have between 5 and 10 people and 45% have less than 5 people (Table 4).

Type of habitat	Hard with fence	67%
	Unfinished with fence	11%
	Hard without fence	22%
Number of pieces	1	23%
	2	33%
	4	44%
Number of people	-5	45%
	5 à 10	33%
	≥ 10	22%
Occupancy status of dwellings	Family property	33%
	Private property	22%
Marital status	Widow(er)	22%
	Married	33%
	Singles	45%
Profession	Traders	23%
	Unemployed	44%
	Middle management	11%
	Households	11%
	Planters	11%

**Table 4:** Socio-demographic characteristics of households using tap water for laundry

The survey also revealed three housing tenure statuses of the respondents in the study area (Table 4). These are family ownership, private ownership and renting. It can be seen that the majority of the respondents are renters, representing 45%. It is noted that 17% of the respondents claim to be owners and 33% of the houses are family properties.

The distribution of households using tap water for laundry by marital status (Table 4) reveals that 45% are single, 33% are married. Only 22% of respondents were widowed. Most of these respondents are unemployed (44%). 22% are traders, 11% are farmers, and middle managers represent only 11%.

### Socio-demographic characteristics of households using tap water for washing up

Among the households using tap water for washing dishes, 62.5% live in fenced houses, 12.5% live in unfenced houses and 25% live in unfinished houses with fences (Table 5).

Type of habitat	Hard with fence	62,50%
	Unfinished with fence	25%
	Hard without fence	12,50%
Number of pieces	1	25%
	2	37,50%
	4	37,50%
Number of people	-5	50%
	5 à 10	37,50%
	≥ 10	12,50%
Occupancy status of dwellings	Family property	25%
	Private property	25%
	Rental	50%
Marital status	Widow	12,50%
	Married	37,50%
	Celibacy	50%
Profession	Shopkeeper	25%
	Unemployed	50%
	Middle management	12,50%
	Planter	12,50%

**Table 5:** Socio-demographic characteristics of households using tap water for dishwashing

25% of these houses have one room, 37.50% have two rooms and 37.5% have four rooms. 12.5% of these households have more than 10 persons, 37.5% have between 5 and 10 persons and 37.5% have less than 5 persons in the household (table 5).

The survey also revealed three housing tenure statuses of the respondents in the study area (Table 5). These are family and private property and tenants. It can be seen that tenants are the most numerous, representing 50%. It can be seen that 25% of the respondents claim to be in a family property and 25% in a private property.

The distribution of households using tap water for dishwashing by marital status (Table 5) reveals that 50% are single, 37.5% are married. Widowers represent only 12.5%. Most of these respondents are unemployed (50%). 25% are traders, 12.5% are farmers and 12.5% are middle managers.

### Socio-demographic characteristics of households using tap waterTo cook the meal

Among households using tap water for cooking, 78% live in permanent fenced houses, 14% live in permanent houses without fences and 20% live in unfinished houses with fences (Table 6).

Type of habitat	Hard with fence	78%
	Unfinished with fence	8%
	Hard without fence	14%
Number ofpieces	1	8%
	2	28%
	3	14%
	4	36%
	5	14%
Number ofpeople	-5	28%
	5 à 10	29%
	≥ 10	43%
Occupancy status of dwellings	Family property	50%
	Private property	7%
	Rental	43%
Marital status	Married	36%
	Singles	36%
	Widow(er)	14%
	Common-law union	14%
	Shopkeeper	22%



Profession	Unemployed	43%
	Housekeeper	7%
	Planter	14%
	Middle management	14%

**Table 6:** Socio-demographic characteristics of households using tap water for cooking

8% of these houses have one room, 28% have two rooms, 14% have three rooms, 36% have four rooms and 14% have five rooms. 50% of these households have more than 10 people and 50% have between 5 and 10 people.

The survey also revealed three housing tenure statuses of the respondents in the study area (Table 6). These are family property, private property and tenants. It can be seen that family property is the most numerous, representing 50%. It can be seen that 43% of the respondents claim to be tenants and 7% are in private property.

The distribution of households using tap water for cooking by marital status (Table 6) reveals that 36% are single, 36% are married. Widowers represent only 14%, while 14% are in a common-law relationship. The majority of these respondents are unemployed (43%). 22% are shopkeepers, 14% are farmers and 12.5% are middle managers. Only 7% are housewives.

#### IV. DISCUSSION

Households in Gbokora, a village within the city of Daloa, use several sources of water for domestic use. The most popular water supply is piped water (47% of households). Africa is the region of the world with the lowest rate of household connection to the water supply system. In most West African cities, the connection rate is less than 50%, and the proportion is even lower in poor neighbourhoods and secondary centres [4]. This phenomenon is recurrent in African urban areas as noted by Sudeshna Banerjee et al (2008) in a report by the World Bank and the Water and Sanitation Program. In this report, Sudeshna Banerjee et al state that piped water reaches more people in African urban areas than any other type of water supply - although its share is less than in the early 1990s. In sub-Saharan Africa 39% of the urban population is connected to piped water, compared to 50% in the early 1990s. They continue their analysis by showing that the majority of urban dwellers who are not served by a utility rely on wells, as is the case in our study.

[5] approach access to piped water from the point of view of its sustainability by asking a specific question: is access to piped water in Ouagadougou part of a long-term logic of social and/or economic ascension? The answer to this question is essential if access to piped water is to be considered the best way to have sufficient quality water to satisfy domestic uses with minimal health and social risks.

According to [6], the Water and Sanitation Programme which is an international partner of developing countries in helping poor people gain sustainable access to improved water and sanitation services, especially on public supply for domestic purposes only (cooking, washing, dishwashing etc.), well water plays a crucial role in domestic use. Taking Zimbabwe as an example, by 2002 over 50,000 improved family wells serving over half a million people had been constructed across Zimbabwe. The household approach has enabled a shift from public systems for drinking water supply to individual household systems for both domestic and productive uses, allowing families to increase their cash income. The potential of this approach is illustrated by describing an example of a successful family farm. The survey was carried out in integrated neighbourhoods such as Gbokora, where well water is still used by the population despite the connection to the drinking water distribution network.

#### V. CONCLUSION

Gbokora is an integrated district of the city of Daloa and has several sources of water supply. These are wells, taps, spring water, etc. Thus, it was in 2005 that the Gbokora district in the city of Daloa was connected to the SODECI water supply system. 47% of households use tap water. Despite being connected to the SODECI water supply system, this village/neighborhood in the city has not been able to abandon well water. Thus, 53% of households say they have wells in their homes.

Water is used for several purposes: cooking, washing dishes and laundry. Thus, 50% of households using well water for washing clothes live in hard fenced houses and 67% of households using tap water for washing clothes live in hard fenced houses. For households using well water for washing dishes, 40% live in hard fenced houses and for households using tap water for washing dishes, 62.5% live in hard fenced houses. For households using well water for cooking, the 25% live in permanent and fenced houses and for households using tap water for cooking, the 78% live in permanent and fenced houses.

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