RESEARCH ARTICLE

CLIMATE CHANGE AND DISEASES SEASONAL IN THE WOROBA (IVORY COAST)

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ABSTRACT

Remote sensing Seasonal diseases have increased in the Woroba Autonomous District over the past three decades. As a result, they represent a major public health problem. This study aims to establish the link between climatic parameters and the emergence of seasonal diseases in Woroba. The methodology is based on a documentary analysis and a field survey. The sources consulted focus on climate change and the emergence of seasonal diseases. The field survey was carried out through direct observation, interviews and a questionnaire. Statistical processing of the data was carried out using the Statistical Package for the Social Sciences (SPSS - version 18.0) software, which allows for the calculation of means, standard deviations and cross-tabulation. A chi-square test was applied to assess the significance of the relationship between climatic factors and the emergence of seasonal diseases. The results reveal a gradual rise in temperatures, with an average increase of 0.8°C per year since 2000. At the same time, rainfall amounts have drastically dropped by 12 to 28% between 1980 and 2000. The incidence of seasonal diseases is higher during the rainy season than during the dry season. The most common illnesses are acute respiratory infections (ARI), malaria, and diarrhea.

INTRODUCTION

Climate and land interact and impact each other. The climate change currently observed is mainly of anthropogenic origin. It is rapid and is essentially characterized by the progressive and irreversible rise in the global temperature of the planet, weather variations, floods, and drought in some places. This causes seasonal environmental diseases (IPCC, 2020, p. 13). Seasonal diseases are conditions that occur at specific times of the year. Today, they represent more than 50% of the conditions experienced by populations. Their seasonality is due to factors linked to climate change such as variations in time, temperature, humidity and the activity of pathogens (Company de Pathologie Infectieuse de Langue Française (SPILF, 2023, p. 1). Populations are inherently exposed to heat, drought, floods, etc. Changes in climatic parameters have tripled the number of respiratory diseases as well as other pathologies in recent decades, causing nearly 250,000 additional deaths per year worldwide. The people most affected are children, the elderly and people weakened by a health condition (E. Nexon et al., 2020, p. 7). The north of Côte d'Ivoire, and even the whole country, is faced with an alternation of seasonal diseases. These include respiratory diseases in the dry season with the presence of dust due to the harmattan winds and malaria due to humidity in the rainy season (S. K Diobo, 2020, p. 346). According to the Ministry of Health, Public Hygiene and Universal Health Coverage (MSHPCMU, 2021, p. 393), the Autonomous District of Woroba in Côte d'Ivoire is not spared from this scourge because each year, more than 8 million people are victims of seasonal diseases, with at least more than 15,000 cases of death. This study aims to understand the link between climatic parameters and the emergence of seasonal diseases in Woroba.

MATERIALS AND METHODS

The study area: The Autonomous District of Worobahas an area of 43,843 km2, or more than 13% of the Ivorian territory. According to the National Institute of Statistics (INS, 2014, p. 5), it is made up of three (03) regions, eight (08) departments, 36 sub-prefectures, 455 villages and 617 camps. It is located in the North-West of Côte d'Ivoire, more precisely between latitudes 640000.000 and 880000.000 North and between longitudes 840000.000 and 1050000.000 West. It is bordered to the north by the Autonomous District of Denguélé, to the south by the Autonomous Districts of Montagnes and Sassandra- Marahoué, to the east by the Autonomous District of the Bandama Valley and to the west by the Republic of Guinea. The 2021 General Population and Housing Census gives 852,139 inhabitants (INS-RGPH, 2021, p. 4). Woroba concentrates a cosmopolitan population living in three regions including the Bafing region, the Béré region and the Worodougou region (Figure 1).

METHODOLOGY

The methodology is based on a documentary analysis and a field survey. The sources consulted focus on climate change and the emergence of seasonal diseases. The field survey was carried out through direct observation, interviews, and a questionnaire. The tools
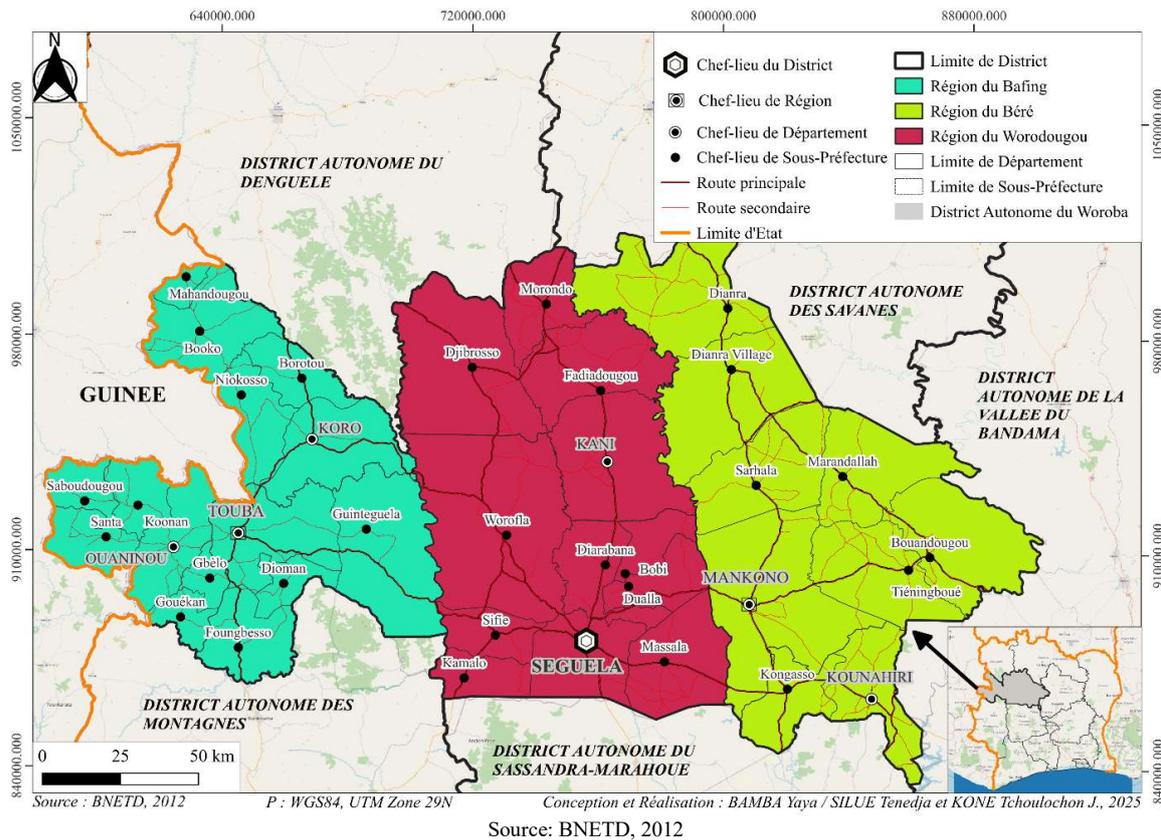
Source: BNETD, 2012

Figure 1. Presentation of the study area/Autonomous District of Woroba

used are a computer, a notepad, and an Android phone. The selection of localities that were retained as survey sites was made based on inclusion criteria. For this purpose, 14 sub-prefectures were selected to conduct the field survey. These are distributed equally among the three regions that make up the district.

Field survey: In the context of this work, field research concerns all activities consisting of obtaining data following direct observation in the field, interviews and administration of questionnaires. Direct observation is carried out in 310 households from the 23,814 households of Worobaas well as health centers. The malaria prevalence rate is 27% in Côte d'Ivoire, according to the WHO biennial report (2022-2023, p. 26). The number of households to be observed during the study using Fisher's formula is:

$n = [t^2 xp\,(1-p)\,]/e^2$.
$n = [(1.96)^2 \times 0.27\,(1-0.27)\,]/(0.05)^2$
$n = [3.8416 \times 0.27 x\,0.73\,]/0.0025$
$n = 302, 87$ households ≈ 310 households
$n = 310$ households

With p = the prevalence of an existing disease, t = 1.96; 95% for the confidence level and 5% margin of error. Thanks to the margin of error, the number of households was increased to 310 to avoid bias. The interviews were conducted using interview guides that were administered primarily to health and administrative authorities. The health authorities we interviewed were the two regional health directors (Séguéla and Odienné, which covers the city of Touba), the four departmental health directors and health data managers within these structures, the branch heads of the National Institute of Public Hygiene (INHP) in Séguéla and Touba, and the directors of the Regional Hospital Centers (CHR) of the Woroba Autonomous District. For the questionnaire, 310 heads of households were interviewed. Reasoned selection criteria were used to select them. Individuals aged 50 and over who had lived for at most 30 years in their locality of residence and who had not made recurring and long trips outside their place of residence. These people are able to identify

periods of severity of climate-dependent pathologies in their locality, due to their experience.

Data collected: Two types of data are collected. Climate data (precipitation and temperatures) were collected from the stations of the Airport, Aeronautical and Meteorological Exploitation and Development Company (SODEXAM) in the Woroba region. They cover the normal reference periods 1961-1990 and 1991-2020. As for health data, they are collected from the curative consultation registers of hospitals and health centers over the period 2017-2020. These epidemiological data were supplemented by health information from selected households.

Processing of collected data: Software was used, including the Package for the Social Sciences (SPSS - version 18.0), which allows for calculating means, standard deviations and cross-tabulation with Microsoft Word and Excel. A chi-square test was applied to assess the significance of the relationship between climatic factors and the emergence of seasonal diseases.Tables and figures are retained from this treatment.

RESULTS

Interannual rainfall variability from 1961 to 2020 in the autonomous district of Woroba: Three regions make up the Woroba Autonomous District: Bafing, Béré and Worodougou. The rainfall stations located in the West of the Woroba Autonomous District, namely Borotou, Ouaninou and Touba, are distinguished by an alternation of wet periods and wet periods (Figure 2, Figure 3 and Figure 4). The analysis of Figure 2 shows the rainfall trend. It is characterized by five periods ranging from the very dry to the wettest from 1977 to 2020, passing relatively from the dry and wet period. It begins with a short period (1977 – 1978) of excess rainfall with an average rainfall of 1478.19 mm. A long period of rainfall deficit from 1979 to 2004 (25 years), with an average rainfall of 1087.51 mm compared to the annual average of the study period. This situation is the same for Figures 3 and 4 of the other stations in the region. This variation is also spatio-temporal.
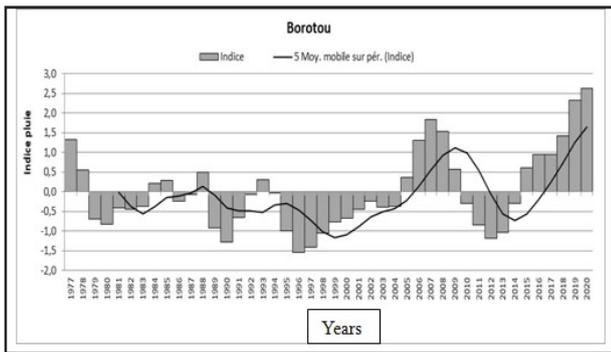
Source: SODEXAM, 2020, Borotou Station

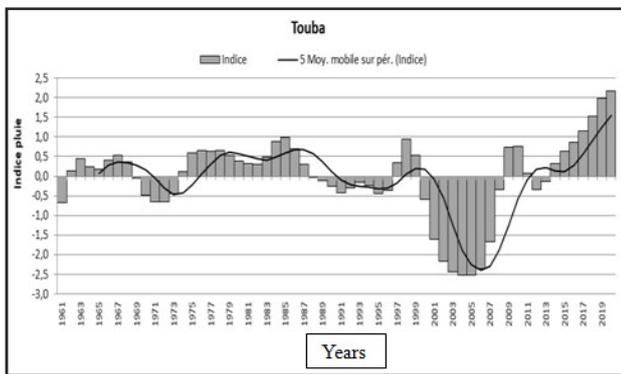**Figure 2. Interannual variability of rainfall heights in Borotou**
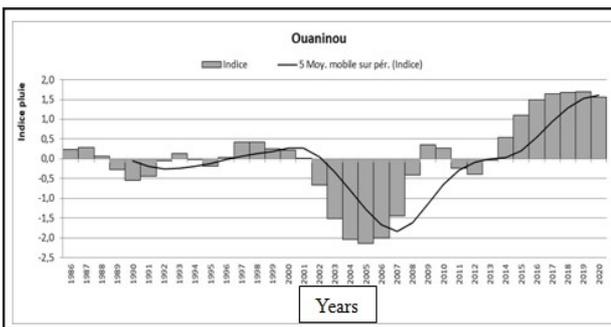
Source: SODEXAM, 2020, Ouaninou Station

Figure 3. Interannual variability of rainfall heights in Ouaninou

Source: SODEXAM, 2020, Touba Station

Figure 4. Interannual variability of rainfall heights in Touba

Spatio-temporal variability of rainfall in the Woroba Autonomous District

Spatio-temporal variability of rainfall by normal: The study of the average annual rainfall values of the Woroba Autonomous District by normal and by decade was carried out using isohyet maps. The rainfall data from 1961 to 2020 were divided into four normals to better understand their evolution. Indeed, during the period 1961-2020, rainfall experienced enormous variations. However, the maximum rainfall heights exceeded 1500 mm of rain. While the minimum rainfall values always varied between 900 mm and 1000 mm of rain (Figure 5 a, 5b, 5c and 5d). Figures 5a, 5b, 5c and 5d demonstrate a transition phase from 1981 to 2000. During these years, isohyets below 1200 mm of rainfall gradually appeared in the eastern and central parts of Woroba. The entire Béré region, including Dianra, Kounahiri and Mankono, is located below the 1100 mm isohyet, in the dry tropical climate zone. During the 1990s, the Woroba Autonomous District experienced the worst rainfall deficits in its history. The 1200 mm isohyet had practically disappeared from the map of the study area, so much so that the 1000 mm and 900 mm isohyets were visible almost everywhere in Figures 5a, 5b, 5c and 5d.

Source: DMN-SODEXAM data, 2021
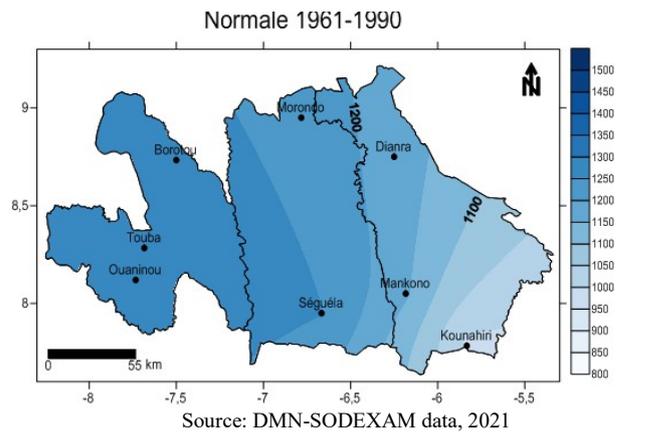
Figure 5 a. Rainfall normals from 1961 to 2020 in the Woroba Autonomous District

Source: DMN-SODEXAM data, 2021
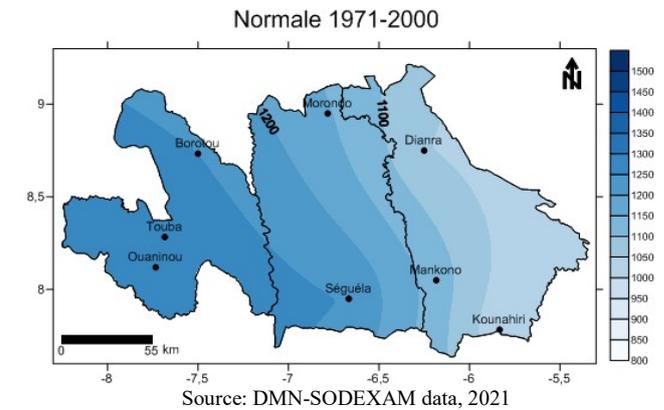
Figure 5 b. Rainfall normals from 1961 to 2020 in the Woroba Autonomous District

Source: DMN-SODEXAM data, 2021
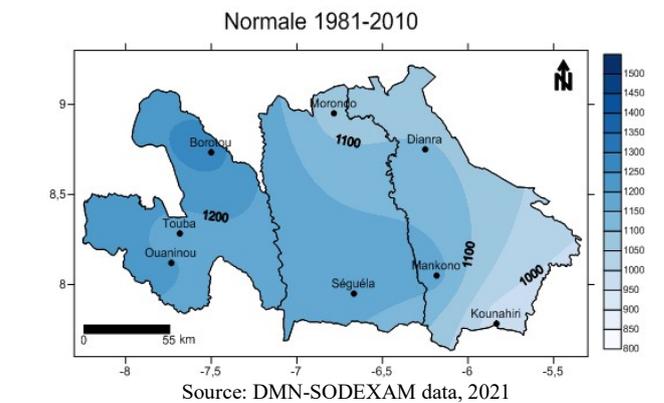
Figure 5c: Rainfall normals from 1961 to 2020 in the Woroba Autonomous District
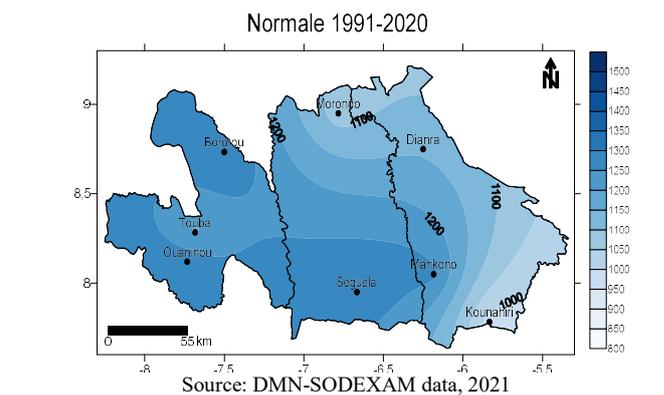

Source: DMN-SODEXAM data, 2021

Figure 5d. Rainfall normals from 1961 to 2020 in the Woroba Autonomous District

Table I. Probability of occurrence (%) of rain and dry haze in Woroba

Probability of occurrence (%) of the…	Bafing region												Selected stations
	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUGUST	SEP	OCT	NOV	DEC	
Rain	15.9	13.2	8.3	32.1	38.4	78.6	61.7	49.5	45.8	40.3	21.7	18.2	**Borotou**
Mist s.	69.0	56.8	00	00	00	00	00	00	00	00	62.6	73.4	
Rain	17.2	9.8	5.7	35.0	42.3	85.2	74.8	53.9	48.7	39.6	25.8	16.4	**Koro**
Mist s.	66.9	55.1	00	00	00	00	00	00	00	00	58.4	62.8	
Rain	12.9	10.0	9.5	37.9	41.3	80.8	56.3	50.2	48.0	43.4	18.9	17.3	**Guinteguéla**
Mist s.	59.4	70.2	00	00	00	00	00	00	00	00	41.0	39.5	
Rain	19.1	19.3	11.7	34.9	48.0	82.8	75.1	54.2	48.7	44.2	23.9	15.7	**Ouaninou**
Mist s.	86.5	70.6	00	00	00	00	00	00	00	00	67.4	51.3	
Rain	20.6	16.2	5.4	37.8	43.1	68.9	55.7	41.6	39.0	38.5	19.2	15.6	**Touba**
Mist s.	63.4	48.9	00	00	00	00	00	00	00	00	58.3	51.4	
	Worodougou region												
	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUGUST	SEP	OCT	NOV	DEC	
Rain	13.7	19.1	11.8	22.7	33.4	51.0	57.6	79.4	68.1	40.3	20.8	17.2	Kani
Mist s.	45.7	56.2	39.5	00	00	00	00	00	00	00	56.8	71.4	
Rain	6.8	14.1	9.4	20.9	36.7	63.2	60.1	87.1	78.8	47.5	12.4	10.9	Morondo
Mist s.	53.3	82.6	42.8	00	00	00	00	00	00	00	47.5	90.2	
Rain	15.4	8.8	5.9	19.4	40.1	48.6	52.5	80.3	71.2	39.4	17.2	14.7	Seguela
Mist s.	32.5	61.2	50.1	00	00	00	00	00	00	00	88.0	56.7	
Rain	11.4	17.0	12.3	23.7	37.4	48.2	54.6	92.1	70.3	35.9	19.8	14.2	Worofla
Mist s.	51.6	60.8	41.3	00	00	00	00	00	00	00	30.7	44.2	
	Béré region												
	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUGUST	SEP	OCT	NOV	DEC	
Rain	9.5	16.2	12.8	29.4	34.1	53.7	47.2	75.3	59.9	40.6	13.5	17.1	Diana
Mist s.	79.9	87.5	55.4	00	00	00	00	00	00	00	86.8	65.4	
Rain	15.2	9.4	5.7	21.6	37.9	55.4	50.1	84.0	73.8	42.3	12.9	18.7	Kongasso
Mist s.	95.8	57.1	46.4	00	00	00	00	00	00	00	45.9	67.3	
Rain	18.7	15.4	9.2	23.7	36.2	58.1	53.4	75.0	63.4	47.2	15.6	13.9	Kounahiri
Mist s.	49	25.7	22.8	00	00	00	00	00	00	00	53.8	70.1	
Rain	20.3	14.1	8.2	25.8	41.2	56.6	49.4	73.8	65.9	38.5	15.6	18.2	Mankono
Mist s.	82.8	53.5	22.9	00	00	00	00	00	00	00	67.0	85.6	
Rain	19.3	12.8	6.2	30.4	38.7	59.1	51.2	68.9	63.4	36.6	17.9	11.4	Tiéningboué
Mist s.	77.1	58.4	42.9	00	00	00	00	00	00	00	72.8	37.6	

Source: SODEXAM and NOAA data/www.crh.noaa.gouv/heat.htm, 2021

Table II. Distribution of disease prevalence in Woroba district

Respiratory diseases

PATHOLOGIES RESPIRATORY	2016		2017		2018		2019	
	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence
Acute respiratory infection (ARI)	2533	13.67%	13761	13.74%	4598	24.81%	8026	43.31%
Bronchiolitis	5262	6.15%	8847	10.34%	11944	1396.00%	20269	23.69%
Asthma	1165	2.85%	1958	4.79%	2640	6.46%	4484	10.97%
Chronic obstructive pulmonary disease (COPD)	14243	10.91%	2350	20.29%	32350	24.78%	54870	42.03%
Bronchitis	1269	8.05%	2166	18.36%	3977	25.22%	5476	34.73%

Diarrheal diseases

PATHOLOGIES DIARRHEAL	2016		2017		2018		2019	
	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence
Acute non-bloody diarrhea	3176	13.41%	5231	18.02%	6248	26.38%	10053	32.79%
Acute bloody diarrhea	321	8.82%	546	13.36%	693	19.43%	816	26.38%
Chronic diarrhea	225	6.14%	249	7.31%	267	8.20%	303	9.97%

Parasitic diseases

| PATHOLOGIES PARASITES	2016		2017		2018		2019	
	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence	Number of cases	Prevalence
Malaria	54268	14.20%	72917	19.08%	96039	25.13%	115414	30.19%
Meningitis	00	-	06	-	14	-	29	-
Dengue	22	-	36	-	48	-	61	-

Source: Séguéla Regional Health Directorate, 2020

Examination of Figure 3.2 presents three major trends in the evolution of rainfall in the Woroba Autonomous District. First, the first two decades (1961-1970 and 1971-1980) were wet periods. During these decades, the Woroba Autonomous District experienced abundant rainfall. The 1200 mm isohyet covers 2/3 of the study area, namely the Bafing region in the West and the Central region. From 1961 to 1970, rainfall amounts never fell below 1100 mm. During the period 1971-1980, rainfall in the Woroba Autonomous District intensified to the point where the 1300 mm isohyets appeared almost everywhere in the Bafing region, covering the localities of Borotou ,Ouaninou and Touba. This analysis justifies the fact that the 1961-1990 normal is called a wet normal.

Then, the decades 1981-1990, 1991-2000 and 2001-2010 are described as dry periods. Rainfall amounts fell considerably throughout the study area. ¾ of the Woroba Autonomous District recorded less than 1000 mm each year during these three decades. The decrease in rainfall varies between 15% and 30% depending on the regions of the study area. The localities of Dianra, Mankono and Kounahiri were the hardest hit by the drop in rainfall amounts. The Béré region appears to be the driest region in the entire Woroba Autonomous District. At this level, some localities recorded drops in rainfall amounts of up to 50%. These are Kongasso,Kounahiri and Djibrosso. Finally, the last of the rainfall evolution in the Woroba Autonomous District is characterized by the return of rain after a long period of drought. From 2011 to 2020, there is a resurgence of rain in the Woroba Autonomous District The 1200 mm and 1300 mm isohyets appear almost everywhere in the study area. This decade is marked by a progressive increase in rainfall amounts to the point where more than 85% of the Woroba territory. This is a wet phase which predicts a return of rainfall as during the 1960s and 1970s. In addition to normal rainfall, there is the probability of occurrence of rain and brown in the three regions of Woroba (Table I). The analysis of Table I shows the probability of occurrence of rain and dry mist (brown rain) in Woroba. The wettest region was Béréand the brownest was Bafing. Table I highlights the distribution of days of harmattan reign and according to the dry months in the Woroba Autonomous District. Thus, the probability of occurrence of dry haze during the dry months made it possible to determine the number of days of harmattan manifestation during these same months. In this regard, it should be noted first of all that the harmattan lasts on average 20 days. However, this duration varies from one month to another: 18 days in November, 20 days in December, 21 days in January, 16 days in February and 13 days in March. Generally speaking, the months of December and January are the months during which the greatest number of days of harmattan manifestation are recorded in the study area with averages of 20 and 21 days respectively. It is also during these two months that the harmattan reaches its peak in terms of the number of days of manifestation far exceeding the monthly average: 27 days in Mankono and Ouaninou, 28 days in Morondo and 30 days in Kongasso. On the other hand, the month of March is the month with the lowest number of days of manifestation of the harmattan in the Autonomous District of Woroba. In March, the number of days of reign of the harmattan is the lowest: 07 days in Kounahiri, 12 days in Kani and 13 days in Tiéningboué. It should be noted that in the entire Bafing region, the harmattan phenomenon is almost non-existent throughout the month of March due to the fact that the number of days of manifestation of the dry haze was zero. Consequently, the harmattan is conspicuous by its absence in the Bafing region. Furthermore, in the Woroba Autonomous District, the number of days of the harmattan is unevenly distributed depending on the stations. Their evolution takes divergent forms. They evolve in several ways. Indeed, the number of harmattan manifestations sometimes evolves in a sawtooth pattern. This is the case for the following stations: Borotou (19 days in November, 23 days in December, 21 days in January and 16 days in February), Touba (17 days in November, 16 days in December, 20 days in January and 14 days in February), Kani (17 days in November, 22 days in December, 14 days in January, 16 days in February and 12 days in March), Morondo (14 in November, 28 days in December, 17 days in January, 23 days in February and 13 days in

March) and Tiéningboué (22 days in November, 12 days in December, 24 days in January, 16 days in February and 13 days in March). In addition to the sawtooth pattern, the number of days when the harmattan occurs often takes on a decreasing appearance in Séguéla and Mankono. In these two localities, we note on the one hand 26 days in November, 18 days in December and 10 days in January, and on the other hand, 27 days in December, 26 days in January, 15 days in February and 7 days in March. Contrary to the regressive evolution in Séguéla and Mankono, Koro and Worofla experience progressive trends in the number of days recording the breath of the harmattan. Thus, in Koro, we have 18 days in November, 19 days in December and 21 days in January. Worofla displays 9 days in November, 14 days in December, 16 days in January and 17 days in February. Next to it, in Dianra, the breath of the harmattan has the longest duration of all the localities in the study area with more than 25 days for at least three months.

Evolution of minimum, average and maximum temperatures: The study of the different temperatures was carried out using descriptive statistics (mean values) and graphical representations. This was possible thanks to the climatic data of the stations selected at the level of the study area (Figure 6 a, b and c).
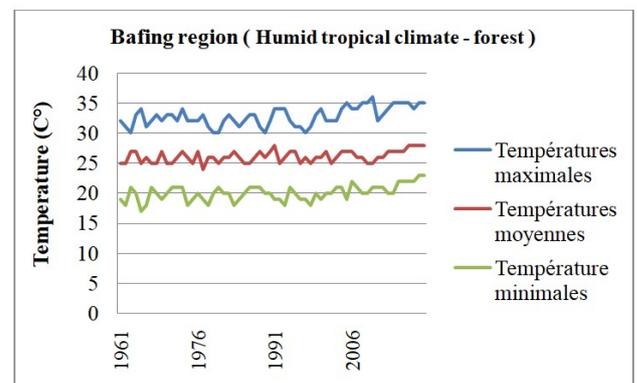
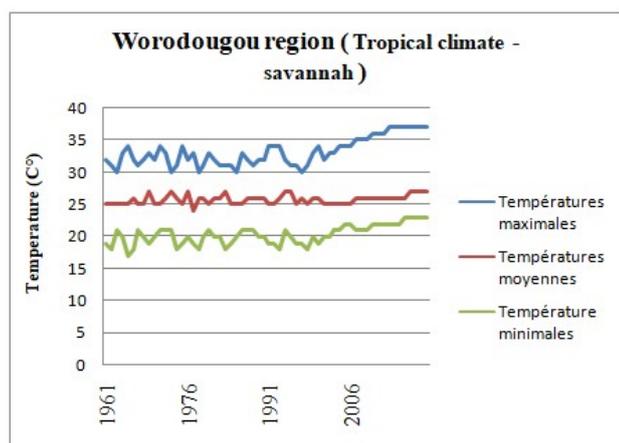Source: SODEXAM and NOAA data/www.crh.noaa.gouv/heat.htm, 2021

Figure 6 a. Interannual variability of air temperatures in the Worodougou region
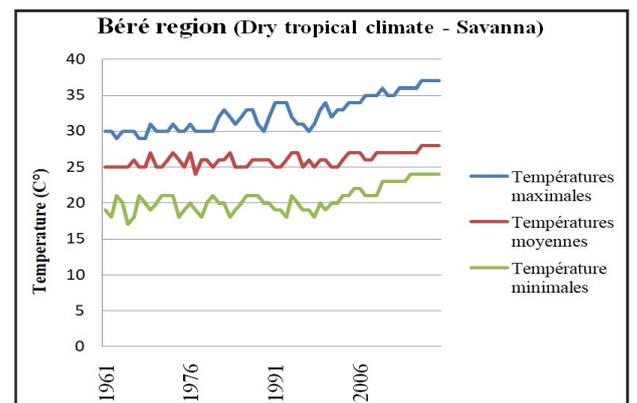
Source : SODEXAM and NOAA data/www.crh.noaa.gouv/heat.htm, 2021

Figure 6 b Interannual variability of air temperatures in the Worodougou region

The examination of the different figures a, b and c shows that in general, all the variability of the types of temperatures in the Autonomous District of Woroba. Indeed, the average annual temperatures have increased between 25°C and 28°C in the study area with a thermal amplitude of 3°C since the 1960s to the 2000s. From the 2010s, the highest average annual temperatures are observed after the 2010s where they exceed 27°C in all regions of the Autonomous District of Woroba. However, the analysis presents slight differences in average annual temperatures between the regions of the study area.

Source: SODEXAM and NOAA data/www.crh.noaa.gouv/heat.htm, 2021

Figure 6 c. Interannual variability of air temperatures in the Worodougou region

They vary between 25.2°C and 26.3°C on average in the Bafing region to the west of the study area; between 26.4°C and 27.9°C on average in the Worodougou region in the Centre and between 26.5°C and 28.8°C on average in the Béré region in the East of Woroba. It should be noted that the average annual temperatures are high in all regions of the Autonomous District of Woroba where they reached the record level of 30°C from 2018. Like the average annual temperatures, the annual maximum temperatures have experienced a remarkable increase. From 1961 to 2020, they varied between 31°C (Bafing Region) and 37°C (Béré Region). In the Autonomous District of Woroba, we find the two main types of climates existing in Côte d'Ivoire: humid tropical climate and dry tropical climate. They are found respectively in the West and East of Woroba. Changes in climate or weather can have impacts on human health.

Climate-sensitive pathologies linked to climatic parameters Woroba district: Climate-dependent diseases are increasingly common among the population of the Woroba Autonomous District. These include respiratory diseases, diarrheal diseases, and parasitic diseases (Table II). The analysis of Table II presents the types of diseases encountered in the populations. For respiratory diseases, the most frequent are ARI with 43.31%, and cases of diarrheal diseases, it is cases of acute non-bloody diarrhea which are the most developed form with a prevalence of 32.7%. For parasitic diseases, malaria is the most virulent with 30.19%. Meningitis is disappearing according to the efforts made by the authorities. As for dengue fever, it is low among the population. In addition to these statistical data, there is data collected in the 310 households of Woroba . In regions with high rainfall, there is high rainfall. Of the 310 households, 96% reported public health problems. The most common illnesses were diarrheal diseases (57%), chronic obstructive pulmonary disease (COPD) (44%), ARI (32%), and malaria (34%). In the dry season, ARI (21%), COPD (17%), diarrhea (13%), and malaria (10%) accounted for 10% of the cases, respectively.

Relationship between climate-sensitive diseases and climatic parameters: The chi-square statistical test will show the significance in both seasons. Hypotheses H0 and H1 are chosen to highlight the link. H0 is null and is considered as if there is no link and H1 is the hypothesis allowing the link to be established. Since the most influential indicator of all diseases is the rainy season period, let us consider the prevalence of diseases throughout this period and by region. Calculation of the P-Value of diseases in the Bafing, Worodougou and Béré regions during the rainy season. From the formula, O_i is the value observed during the survey in health centers and E_i is the value heard among populations in households.

$$X^2 = \sum [(O_i - E_i)^2 / E_i]$$

$$X^2 = \sum [(44 - 43,31)^2 / 43,31]; X^2 = 0,01 \leq 0,05$$

Woroba diseases is $0.01 \leq 0.05$. There is therefore a link between rainfall variability and population health.

DISCUSSION

The health of the population has become more fragile in Worobain recent years. This is due to the variability of temperatures and rainfall. For temperatures, they vary between 25.2°C and 26.3°C on average in the Bafing region in the west of the study area; between 26.4°C and 27.9°C on average in the Worodougou region in the center and between 26.5°C and 28.8°C on average in the Béré region in the east of Woroba. The results are confirmed by the Intergovernmental Panel on Climate Change (IPCC, 2020, p. 5), which predicted that the temperature ranges of planet Earth will vary over the remaining decades. Today, these ranges are 1.1°C in the West, 1.5°C in the Center, and 2.3°C in the East, respectively. These values far exceed the predictions at the time. In this sense, man is moving towards an increase in the prevalence of climate-sensitive diseases. Certainly, these diseases exist but they are more influenced by climatic parameters such as rainfall, temperature, heat waves, floods, droughts, etc. This causes many diseases among populations. For respiratory diseases, the most frequent are ARI with 43.31%, and cases of diarrheal diseases, it is cases of acute non-bloody diarrhea which are the most developed form with a prevalence of 32.7%. For parasitic diseases, malaria is the most virulent with 30.19%. The results are supported by (T. Silué et *al*., 2020, p. 67) noting that theprevalence of environmental diseases varies seasonally. In Korhogo, the prevalence of malaria during the rainy season is 52% among female producers (cases) and 36% among non-producer women (controls). The rate varies during the dry season with 26% among cases and 11% among controls. In addition to these statistical data, there is data collected in the 310 households of Woroba.

Of the 310 households, 96% reported public health problems. The most common illnesses were diarrheal diseases (57%), chronic obstructive pulmonary disease (COPD) (44%), and malaria (34%). These illnesses are more common during the rainy season than the dry season. The African Climate Policy Centre (ACPC, 2014, p.1) notes that climate change can alter temperature, air movement and precipitation and thisin differentways and to varyingdegreesacross Africa. This will have significantconsequencesfor humanhealth. The effects of climate change on humanhealth, as well as the impactadditional impact on the environment and on the economies of African countries, are likely to hinder thedevelopment. woroba diseases is $0.01 \leq 0.05$.This confirms that precipitation has an impact on human health. Theseresults are discussed by the International Organization for Migration (IOM, 2020, p. 1) which states that The number of people migrating due to the adverse impacts of climate change, environmentaldegradation, and disasters on theirlivelihoods, dailylives, and healthisincreasing and will continue to increase in the future if adaptation and mitigation measures fail to address the scale of the crisis. At the same time, mobilityis a social determinant of health and can contribute to disease transmission. Indeed, climate change isexpected to exacerbateclimate-relatedhealthrisks, including communicable diseaseoutbreaks, barriers to accessinghealth services, and prematuredeathsfrom malnutrition, heat stress, and the increased spread of disease-relatedillnesses. For the World Health Organization (WHO, 2002, p. 9) supported this point of view by stating on the one hand that during the year 2000, climate change was responsible for 2.4% of cases of waterborne diseases and 6% of cases of vector-borne diseases, on the other hand, the risks linked to climate-sensitive pathologies will double in 2030. In this case, more than ¾ of the world population will be affected by diseases sensitive to climate change.

CONCLUSION

At the end of this work, it is important to synthesize the climatic aspects which influence the health of the populations in the Autonomous District of Woroba.several parameters exist. But in this

work, this are the temperatures and precipitation that the accent East scope. Climate-sensitive diseases are conditions that occur at a period data of the year. Their prevalence varied in function of the two periods of the year. During the rainy season, they present all prevalences important and during the season dry, their prevalence decrease. Among the three major regions including Bafing, Béré and Worodougou, it is Béré which presents a bigger one prevalence of climatic diseases. This high prevalence of diseases is linked to the increase in precipitation and temperatures in this region.However, the most virile diseases are ARI, diarrhea, malaria and others. To break the emergence of these diseases, it is necessary that populations can practice means climate adaptation in order to mitigate the consequences.

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