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Interpretation of Climate Change and its Impact on Agriculture and the Local Economy in the Bamoun Territory (cameroon)

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ABSTRACT

Throughout history, humanity has often faced challenges aimed at taking control of its destiny and harnessing its environment. For industrialized societies, the technological age we are currently experiencing seems to offer unprecedented control. In Cameroon, it was following the Earth Summit held in Rio de Janeiro from June 3 to 14, 1992, that climate change began to be popularized by the media. In the agricultural and economic sectors, one of the questions raised concerns the perception and impact of climate change in a region like the Noun department in the west of the country, where the population relies primarily on agriculture. This article examines the interpretation of climate change and its impact on agriculture and the local economy in Bamoun territory. This study aims, through a simplified historical overview of climate change science, to present, among other things, the Bamoun region of western Cameroon: its geographical data, its economic landscape, and the local perception of climate change. It will also address a climate overview for the 21st century, the extent of public concern regarding climate change, biodiversity, and ecosystems, and finally, the environmental and economic problems that it can generate. The methodology of this study is based on literature reviews, as well as in-depth interviews conducted in 2024 with farmers in Foumbot and Kouoptamo, two rural communes in the Bamoun region of western Cameroon.

Keywords: Climate change, impact, agriculture, territory

INTRODUCTION

Throughout history, humanity has often faced challenges aimed at taking control of its destiny and harnessing its environment. For industrialized societies, the technological age we are currently experiencing seems to offer unprecedented control. In Cameroon, it was following the Earth Summit held in Rio de Janeiro from June 3 to 14, 1992, that climate change began to be popularized by the media. In the agricultural and economic sectors, one of the questions raised concerns the perception and impact of climate change in a region like the Noun department in the west of the country, where the population relies primarily on agriculture. This article examines the interpretation of climate change and its impact on agriculture and the local economy in Bamoun territory. This study aims, through a simplified historical overview of climate change science, to present, among other things, the Bamoun region of western Cameroon: its geographical data, its economic landscape, and the local perception of climate change. It will also address a climate overview for the 21st century, the extent of public concern regarding climate change, biodiversity, and ecosystems, and finally, the environmental and economic problems that it can generate. The methodology of this study is based on literature reviews, as well as in-depth interviews conducted in 2024 with farmers in Foumbot and Kouoptamo, two rural communes in the Bamoun region of western Cameroon.

I. THE BAMOUN COUNTRY OF WESTERN CAMEROON: GEOGRAPHICAL DATA, ECONOMIC LANDSCAPE

The Bamoun territory boasts a rich natural and cultural heritage with diverse resources. These include rivers, the main ones being the Noun, the Mapé, and the Mbam; volcanoes (including Mount Mbapit); several lakes, some of which have been developed; peaks reaching over 2,000 meters in altitude (Mount Mbapit, Mount Kougham); exploited subsoil with numerous quarries (notably basalt); marshes; and water retention dams. The region exhibits a great diversity of landscapes and uses of the subsoil, soils, peaks, and water. All of this constitutes a wealth of economic resources, primarily agricultural and pastoral. The territory also possesses a rich natural heritage, some of which is exploited by humans, such as Lake Petpenoun and Mount Mbapit. Its communal areas number nine, including Foumban, the capital of the department and the most populated, Foumbot, Koutaba, Kouoptamo, Bangourain, Magba, Malantouen, Njimom, and Massangam (the largest area), which have varied characteristics and which condition contrasting activities. The Nun in its physical and natural dimension: a land of contrasts. The quality of life and the degree of attractiveness of the Bamoun territory are intimately linked to its natural heritage, its geophysical resources, its pleasant climate, and the beauty of its landscapes and the diversity of its reliefs. Located between the 5th and 7th degrees of North latitude, and between the 10th and 12th degrees of East meridian, the Bamoun kingdom (Noun department), an integral part of Greater Western Cameroon, is geographically limited: - to the North by the Adamawa region (city of Banyo) - to the Northwest by the department of Donga-Mantung, Bui and Mézam, - to the East and South by the Mbam, - to the West and Southwest by the Bamboutos, the Mifi and the Ndé. Largest department in the West region of Cameroon, with its 7687 km², or 55.35% of the extent of the region estimated at 13890 km², the Bamoun kingdom serves as a border with the Centre, Adamawa, and North-West regions.

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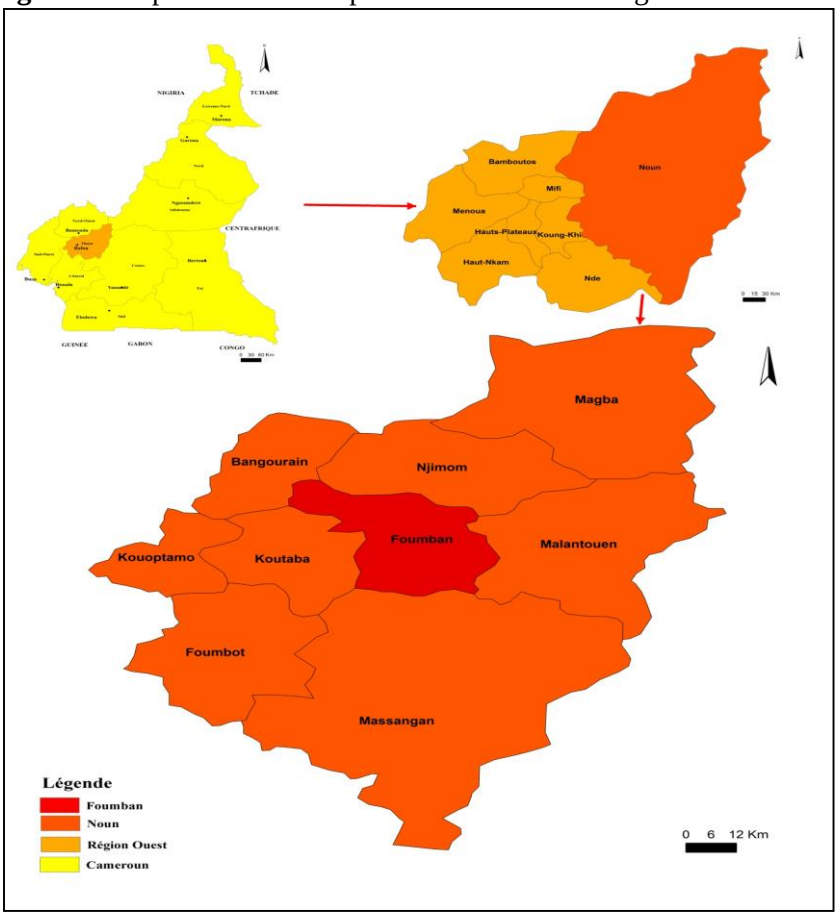
Figure 1: Map of the Noun department in the West Region of Cameroon



A.Nchare (December 2025)

The department's geography creates ideal conditions for agriculture, earning it the nickname "the breadbasket of Cameroon." This reputation is reinforced by a temperate climate, partly due to altitudes ranging from 900 to 1,200 meters, which benefit both residents and travelers and foster crop diversity. The fertile soils yield at least two subsistence harvests annually for the predominantly farming population. Of particular note is the prevalence of reddish-brown ferralitic soils, derived from Hawaiian-type basalt flows. These soils possess normal drainage and distinct profiles: from 0 to 30 cm, a loose, crumbly structure with high porosity; from 30 to 180 cm, a silty layer with aggregates of medium cohesion and tubular porosity; and from 180 to 230 cm, a clayey layer with basalt fragments. The subsoil's mineral wealth has been tapped but still holds significant untapped potential. The region's varied landscapes—spanning the western volcanic chain—feature plateaus and mountains, including Mbam (2,300 m), Nkuegham (2,290 m), and Mbetpit (2,000 m), the latter currently being developed for tourism.

Photo 1: Mount Mbetpit

Armand Nchare (January 2025)

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Another distinctive feature is that this terrain is divided into three geographical zones: the low zone located between 500 and 1000m altitude and comprising the Noun plain, the Baigom plain, the Tikar plain, and the Mbam plain. - the plateau area, situated between 1000 and 1500m altitude, extending from the Noun cliff to Foumbot, gradually opening in tiers onto the hill ranges in the Tikar plain - the high-altitude zone, from North to South of the department, between approximately 1500m and 2500m. From a hydrographic point of view, the department is watered by several rivers, the most important of which are: - the Noun, from which the department takes its name, and which forms a border with the Bamileke country. The Mvi and the Mapé which flow directly into the Mbam; - fast-moving waterways such as the Nchi, whose waterfalls are used for local electrification, the prevailing climate is that of the Sudanese-Guinean highlands, quite cool and marked by two seasons, namely: - a dry season from November to March with an average temperature ranging between 25°C and 32°C - a rainy season from March to October with an average temperature ranging between 14°C and 21°C. In terms of its geographical diversity, the department also has several lakes: - Lake "Petponoun", where a modern and significant tourist activity is developing - Lake COC, named after a famous agricultural plantation - les lacs (Matapit, Sanka, …)

Photo 2: Lac Petpenoun

Armand Nchare (january 2025)

In the Population of the Western Region of Cameroon, the Noun Department is unique in that it is predominantly inhabited by a single ethnic group (the Bamoun), who speak a single language. Other ethnic groups, such as the Tikar, Bamileke, Hausa, and Bororo, also coexist within the Bamoun community. The latter have come to identify with the Bamoun and are also well-represented as non-Bamoun populations. The most recent local population estimate, conducted in 2010, puts the region's population at approximately 820,000, with 42.3% living in urban areas and 57.7% in rural areas. The working-age population comprises 80% of the total, with young people representing between 55% and 80% of this figure, which is constantly fluctuating. Over 25% of the working-age population earns their living from trade, agriculture, and crafts. The economy of the territory, the economy of Noun, remains dominated by agriculture, which employs 60 to 70% of its working population and contributes over 60% of its wealth. Colonial plantations managed by powerful companies once existed in this department, which, for a long time, relied on coffee cultivation as a major source of income. The fall in international coffee prices starting in 1988 led to a decline in Noun's coffee production and continues to significantly disrupt the department's economic order today. After the golden age of coffee, the Noun region is now renowned for its food crop production across its territory and its market gardening activities in the Mount Mbappit area (Foumbot, Kouoptamo, etc.). Its significant production in this sector has earned it the title of "breadbasket of Cameroon and Central Africa," as the Foumbot market remains a major source of produce for the country and the sub-region (Gabon, Congo-Brazzaville, Equatorial Guinea, Central African Republic) (tomatoes, green beans, red beans, white beans, watermelons, peppers, etc.). For example, in 2006, the Cameroonian government and the Islamic Development Bank established an agency tasked with improving agricultural production and incomes in the Noun department. This refers to the Mount Mbappit Rural Development Project (PDRM), whose main objective was to contribute to poverty reduction and improved food security for the population by revitalizing food crop and vegetable production, while ensuring the sustainable management of natural resources. This four-year project included infrastructure development through the improvement of lowland areas (developing and making available to communities 1,200 hectares of lowland, 940 hectares with full water control, and 260 hectares with partial control). This area enabled the establishment of 3,000 modern farmers who received specific support for the development of intensive agriculture capable of significantly increasing the production of food crops and vegetables (maize, peanuts, beans, rice, sweet potatoes, tomatoes, carrots, etc.). The development of these lowlands has created large agricultural production areas where intense economic activity will be fostered. This project also aimed to rehabilitate 105 km of rural tracks, including 36 km of road between Foumban and Malantouen and 60 km of access tracks to the lowlands; construct 10 schools, each with three fully equipped classrooms; 6 fully equipped health centers; 16 fully equipped water boreholes;

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4 rural markets; 3 community huts; provide outreach, awareness-raising, and training for beneficiaries; and support agricultural extension services.

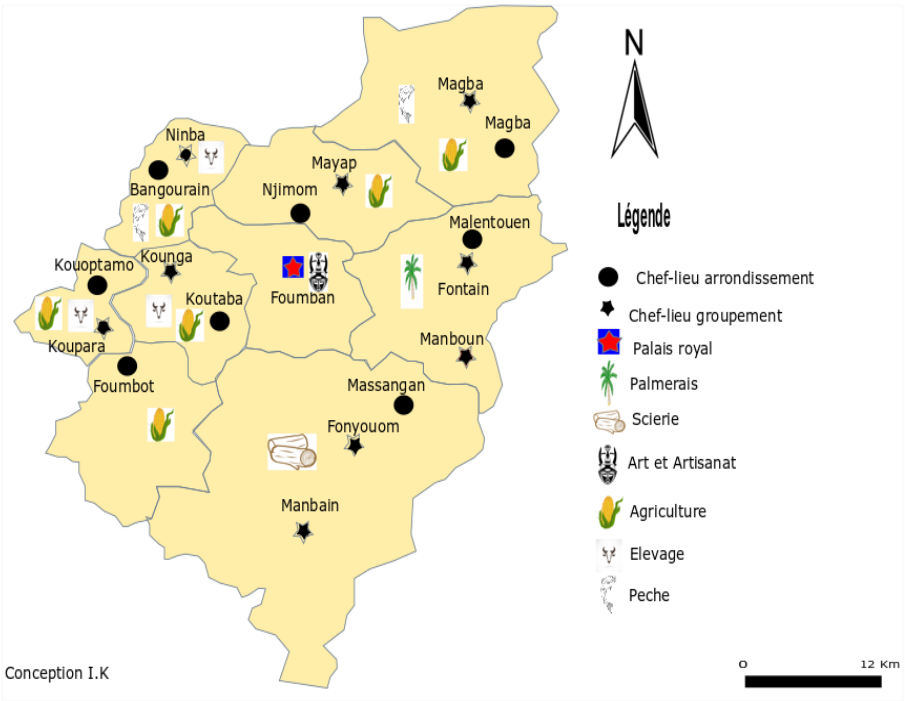
II. CONTRASTING ECONOMIC SPACES

A comparative approach to the municipalities of Foumbot Kouoptamo and Foumban. However, the overall economic situation across the region cannot mask the differences and contrasts between municipalities. A comparative analysis of two significant municipal areas clearly demonstrates this diversity and certain functional specializations within each area. These comparative spaces highlight geographical, economic, and social specificities. We will describe, on a case-by-case basis, the local economy, the operational logic of economic actors, and the skills and potential mobilized in our three comparative areas. Foumbot: a border economy. The second largest town in the Noun department by population, Foumbot's agri-food market is its commercial heart. A true gateway and crossroads for trade, the town is located on the border between the Bamoun and Bamiléké regions, with the bridge over the Noun River serving as the border and the location of the road toll between the departments. At the beginning of the 20th century, the French administration in Cameroon decided to develop a leading industrial coffee-growing region in its new colony. It selected several areas, including the western highlands, particularly the commune of Foumbot. From 1930 to 1990, Foumbot was a major coffee-producing area, but the constant instability of coffee prices discouraged growers. Gradually, a new development path based on the production, marketing, and processing of food and market garden produce took root. Its geographical location, bordering the Bamileke region and not far from the Banen region, made the town a crossroads for trade and an area conducive to economic growth at the intersection of the three countries. Furthermore, Foumbot exported fruits and vegetables to the country's main cities, Douala and Yaoundé, and to the Kyo-Si market (at the borders of Cameroon, Equatorial Guinea, and Gabon). And then towards other Central African countries: Gabon, Congo, Equatorial Guinea, and the Central African Republic. The inhabitants of Foumbot are primarily farmers and traders. a) Kouoptamo “The hospitality economy”, nature tourism. Like Foumbot, but slightly set back from the main road, the inhabitants of Kouopatmo are primarily engaged in agriculture, agricultural diversification, cattle, sheep, and pig farming, and fish farming. The commune is notable for the significant role of a public experimental and training center, the Kounden livestock station. It is worth noting that the town of Kouoptamo hosted the first Agro-Pastoral Show in Cameroon in the early 1960s. To this day, it is renowned for its role and prominent position among major agricultural areas. Known as the "breadbasket of the republic" due to the abundance of foodstuffs found in its bustling market, its fertile soils allow it to supply the market with food and vegetable products in industrial quantities at any time. Kouoptamo also boasts several sites and landscapes renowned for their beauty, the most attractive of which are:

• The highly popular twin lakes of Petpenoun and the entire Petpenoun tourist area, the development of which was carried out by a private French investor.
• The crater lakes of Njidoun with the legend of the water peoples;
• The 370ha Petpenoun agricultural farm;
• The Nkoham mountain ranges;

The communal forest is planted with eucalyptus trees.

Figure 2: Map of agropastoral activities in Bamoun country



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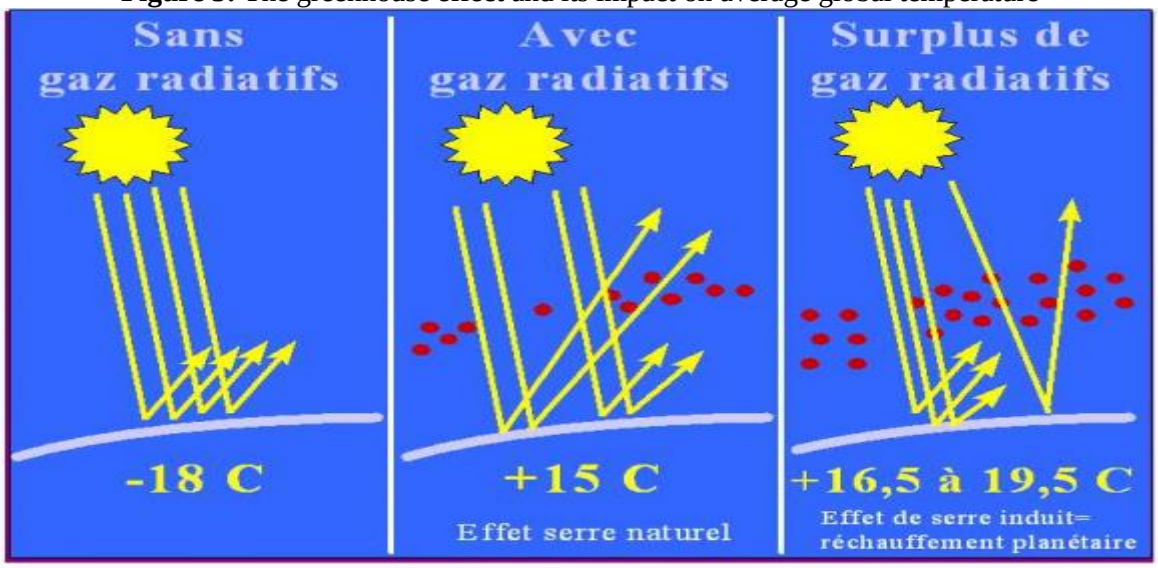
III. SOCIAL INTERPRETATION OF CLIMATE CHANGE

1. Description of climate change

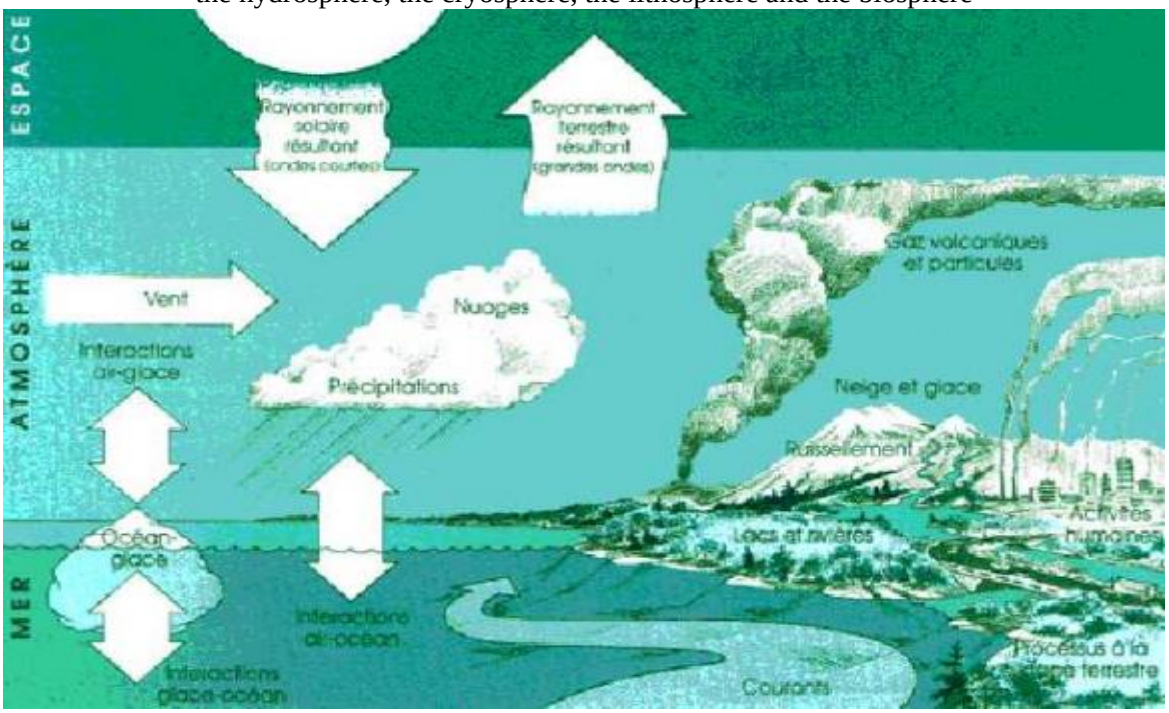
The Earth's atmosphere allows sunlight to pass through, warming the surface of the globe. The heat rising from the surface is partially absorbed by gases and water vapor present in the atmosphere: this is the "greenhouse effect." In the absence of greenhouse gases (carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O)), most of the heat entering the Earth's atmosphere would be emitted back into space, and the average temperature of the Earth would be -18°C instead of 15°C.

Figure 3: The greenhouse effect and its impact on average global temperature



The amount of these greenhouse gases in our atmosphere has remained relatively constant over the last 10,000 years. This has allowed the Earth to maintain a relatively stable climate. The advent of industrialization led to the concentration of these gases, increased energy demand, population growth, and changes in land use. The experiment, which began with industrialization, has therefore consisted of maintaining the increase in atmospheric greenhouse gas concentrations by burning enormous quantities of fossil fuels (natural gas, oil, and coal, which generate significant amounts of CO2) and by continuing deforestation (forests remove CO2 from the atmosphere). The increase in greenhouse gas concentrations intensifies the natural greenhouse effect and raises the average global surface temperature. This global warming causes climate change across all climate parameters because it triggers a modification of atmospheric circulation and other subsystems of the climate system.

Figure 4: The 5 subsystems of the climate system: the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere



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2. Historical overview of climate change

At the very beginning of the last century, climatology focused primarily on determining statistics for various parameters such as temperature, precipitation, wind speed, and so on. This allowed scientists to explain environmental and geographical characteristics, as well as the construction of buildings and infrastructure. Then, around the middle of the century, scientists began to examine the physical and chemical processes that explain these statistics. For example, it was during this period that significant climatic disturbances originating from the Equatorial Pacific Ocean were observed. In the 1970s, some specialists examined the potential impact of the increased concentration of greenhouse gases observed in the atmosphere. According to some estimates, by the end of the 21st century, the average global surface temperature will increase by approximately 1 to 3.5 degrees Celsius compared to 1990, based primarily on current projections of increased atmospheric concentrations of greenhouse gases and sulfates. These temperature changes, which will lead to alterations in all subsystems of the climate system, will not occur uniformly across the planet. The landmass will warm more than the oceans, and year-round warming is predicted in high latitudes. Naturally, temperature will not be the only factor affected. Precipitation patterns, storm intensity, and storm tracks will respond to new climate forcings. In sub-Saharan Africa, studies conducted by Servat et al. (1999) in Central and West Africa on rainfall variability show that between 1960 and 1983, the countries in these regions experienced climate variability characterized by changes in the length of rainy seasons and the occurrence of rainfall outside of expected periods. They conclude that climate variability is not only observable in the Sahel: "rainfall deficits have also affected forest regions and, more generally, so-called 'humid' Africa" (Servat et al., 1999). This research, carried out in West and Central African countries, including Cameroon, reveals a gradual change in climate, and one might wonder how, on a daily basis, urban populations in sub-Saharan Africa are reinterpreting the concept of climate change in light of their village experiences. Indeed, in light of the media coverage of the concept of climate change, what is its perception at the local level?

3. The reason for concern is related to climate change

Rising temperatures or any change in climatic parameters inevitably have impacts on the environment and socio-economic activity. Indeed, sectors such as agriculture, forestry, ecosystems, economic activity, and energy production and demand have all adapted to historical climatic parameters. Consider the farmer managing fruit, vegetable, or cereal crops; the fish and birds so sensitive to fluctuations in the water level of Lake Monoun in Kouoptamo or the Koup River in Foumbot; all these activities, already sensitive to natural climate variability, will necessarily be affected if we observe a significant fluctuation in climate statistics throughout history. Given this reality, while acknowledging the uncertainties, one possible scenario is the preparation and implementation of adaptation strategies to a new climatic reality, because several events (floods, storms, etc.) suggest that their socio-economic systems are poorly adapted to the natural variability of the climate.

IV. THE INTERPRETATION OF CLIMATE CHANGE IN BAMOUN COUNTRY

Knowledge about climate change is a composite body of knowledge, produced by scientific discourse and the local populations' own observations. In the Bamoun region, climate change is the result of the people's lived experience of the climate. The variability of the seasons is the primary element perceived as a sign of climate change. It is therefore based on these tangible elements that local populations define and establish the link between climate change and the decline in their agricultural production. Foumbot and Kouoptamo in the Noun region are primarily agricultural areas. The farmers we met define climate change based on the seasonal disruptions affecting their crops. The arrival or absence of rain at expected times is central to their understanding of climate change. The seasons no longer follow generally recognized patterns, which explains the disruption to their livelihoods. “The seasons and temperatures are changing. Before, in the 1980s, when the rainy season was supposed to start, it rained. Nowadays, when it's forecast to rain, it's hot. There's no difference between the seasons. There's confusion.” Claude, a teacher at the Kouoptamo public school and also a farmer, confirms this difficulty in predicting the weather: “The rain should normally start between February 10th and 30th each year. So far, at the beginning of April, we're still waiting for rain. It's too hot.” I have a field in Foumbot, and sometimes I walk there because it's so hot. I've never seen anything like it. It's the same with the dust! I've never seen anything like it here. It's in the north of the country that they often have white dust, but not here in the village. We've never seen anything like it. Now that they've cut down all the trees in the east of the country, we're seeing the repercussions here in the west! In the 1970s, we would sow corn around March 15th, and the last seeds would be sown on March 30th. Now we don't respect those dates anymore because of the heat. We have many different planting windows, whereas before it was more consistent: right now, we're in the rainy season, but we can go two or three years without rain! Climate change brings a number of challenges to seasonal crops. Now, faced with ever-increasing food demand, the use of lowland areas and agricultural inputs contributes to year-round vegetable production, without negating the need for rainfall to irrigate the soil. These seasonal experiences suggest the impact of climate change. However, in Bamoun country, and more specifically in Foumbot and Kouoptamo, vegetable crops are also cultivated in lowland areas, contributing to a third annual harvest.

V. PROSPECTS

If agricultural yields and productivity are disrupted and worsened, there is a risk of famine. However, farmers are accustomed to specific crops and will need to adapt to make the most of them and minimize the drawbacks. The increased frequency and duration of heat waves and hot, dry spells linked to climate change could lead to more widespread and destructive wildfires. Thus, climate change could contribute to the disruption of Earth's natural ecosystems, potentially leading to the extinction of wild and native animal species. Therefore, the impact of climate change on habitats and ecosystems will be the primary factor determining the impacts on

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biodiversity in the Bamoun region. Nesting birds, which sometimes only stay briefly in specific locations, could react negatively to any disturbance to the ecosystem. Furthermore, several fish species, for which a variation in water temperature of just a few degrees can determine the sex of new populations, will be affected, disrupting, for example, the region's food chain. Among people with fragile health, the elderly, young people, and those with chronic illnesses, climate change could lead to an increase in the number of deaths related to heat, allergies, and respiratory and cardiovascular diseases. In short, these few examples only paint an incomplete picture of the potential impacts of climate change. Whether it concerns agriculture, biodiversity, forestry, energy, etc., each of these climate impacts entails costs that affect the agricultural, pastoral, and economic activities of the Bamoun people. It is urgent to consider and raise awareness about reducing greenhouse gas emissions at their source. This could help eliminate or slow the progression of climate change.

CONCLUSION

Regarding climate change, its interpretation, and its impact on agriculture and the local economy in Bamoun territory, one of the questions raised concerns the perception and impact of climate disruption in the Noun department, where the population relies primarily on agriculture. This article, through a simplified historical overview of climate change science, presents, among other things, the Bamoun region of western Cameroon, including its geographical features, economic landscape, and local perceptions of climate change. We also explore a climate overview for the 21st century, the reasons for public concern about climate change, biodiversity, and ecosystems, and finally, the environmental and economic problems it can create. Our study shows that in Foumbot and Kouoptamo, climate change highlights two main elements: rising temperatures and irregularities in seasonal variations, particularly the unpredictable timing of the rainy season for maize cultivation. Our surveys reveal that popular discourse on climate change reflects the perception among farmers and fishermen of their vulnerability. Their sense of powerlessness in the face of the prevailing climate disruption underscores their vulnerability. Furthermore, while the term "climate change" is known and used by our interviewees, it is often confused with seasonal and climatic variability.

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