Population Perception of Natural Resources Management in Bamenda Health Districts in the Context of COVID-19

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ABSTRACT

The COVID-19 pandemic has become a major public health concern worldwide, which can impact population perception and social responsibility as well as people's quality of life. In this context, the population perception of COVID-19 has effectively changed people's attitude, as it was characterized by a period quarantine, social isolation and heath crisis. This study aims to analyze the population perceptions of natural resources management in Bamenda health districts in the context of Covid-19. Data used here derive from a cross-sectional study conducted in the city of Bamenda in 2021. Both literature review and field investigations were undertaken using 307 questionnaires. The key findings show that there was an increase in energy consumption as observed through the high electricity bills, difficulties to manage natural resources like the forest, water due increased in-home consumption. it is recommended that sustainable measures should be put in place to effectively manage natural resource for future generation, public awareness regarding the significance, necessity, and strategies for protecting oneself in the event of future pandemics should be enhance.

Keywords: population Perceptions, Covid-19, Pandemics, Resources management, Bamenda.

INTRODUCTION

OVID-19, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2(SARS-coV-2). This virus was first identified in December 2019 in Wuhan, China (WHO, 2020). The World Health Organization declared a public Health Emergency of International Concern regarding COVID-19 on 30 January 2020, and later declared a pandemic on 11 March 2020(*ibid*). The level of COVID-19 pandemic in Bamenda health district grew at a faster rate than ever expected. About 610 confirmed cases have been identified already and 61 have died (MINISANTE, 2020).

The COVID-19 pandemic has gad far-reaching impacts on various aspects of society, including natural resources Bamenda, a city in the Northwest Region of Cameroon, has not been immune to these impacts. As a densely populated urban area surrounded by rural communities, rely heavily on natural resources for their livelihoods. Therefore, the pandemic has exacerbated existing challenges in natural resources management, including deforestation, soil degradation and water scarcity. People started complaining about the high rate of expenditure with home choices since everyone is at home from morning still night and the rate of food consumption has greatly increase with limited food supply, individual desires were not reachable since roads were not movable during the lockdown and increase in prices of goods, the rate of dependency on others for survival also increased. Then, COVID-19 has highlighted the need for sustainable natural resources

management in Bamenda. Efforts to address environmental challenges must be integrated into a pandemic response and recovery strategies. Therefore, this paper seeks to portray the environmental perception of COVID-19 pandemic by the population of Bamenda town.

LITERATURE REVIEW

COVID-19 pandemic is challenging the world's economic and health systems and exemplifies the degree of global interdependencies and need of preparedness for global health threats. Much of the focus is now on the response to the pandemic and the development of treatment and vaccines. Health threats due to human impacts on earth may appear to be of less immediate concern: climate change, pollution, urbanization, unsustainable consumption that have led to major environmental disturbances and biodiversity loss.

It may be tempting to develop solutions to the pandemic independently of these threats, such as relying on disposable materials, reducing public transport use and subsidizing heavily polluting industries. Such responses might yield short-term health and economic benefits but would forfeit needed long-term improvements in human health and sustainability. In fact, the COVID-19 crisis highlights the links between environmental changes and emergence of infectious diseases and warns us of the urgent need to prevent such pandemics, as their control has proven to be highly challenging in the globalized world (Barouki, et al., 2021).

The COVID-19 crisis has unleashed a plastic disaster, reversing the achievement of a decade of activism against single-use plastic worldwide, including in Nepal (Awale and Kumar, 2020).

As a consequence of the pandemic, the volume and sources of waste generation change; however, the traditional causes of environmental pollution from the different sectors like transportation, aviation, and industries have declined sharply (Sarkodie and Owusu 2020). Due to fear of being infected by the virus, human's new lifestyles like staying at home, restricted travel, online shopping and stockpiling foods, etc. have contributed tremendously to household wastes (Benker 2021; Hao et al., 2020). However, only few studies have been reported on household waste management during covid-19. Di Renzo et al. revealed that household food loss and waste (FLW) has increased by 12% from extra-domestic consumption during pandemics (Aldaco et al. 2020). In Canada, the short-term changes in household waste flow due to covid-19 disruptions resulted in changes in waste diversion and education have been reported (Ikiz et al. 2021). Likewise, a survey conducted in Morocco depicted that 87% of respondent's mix coronavirus protective equipment with household waste, which may contribute to the spread of the virus (Ouhsine et al. 2020).

Hallema et al. (2020), emphasize that the environmental responses to economic slowdown, triggered by the pandemic, resulted in a negative effect of human beings and organizations on the environment. In this scenario, the analysis of population awareness about water consumption represent an essential tool for water efficiency and decision-making procedures, aligned with the challenges that have risen due to the scarcity of water resources.

Another important element is air pollution, according to Zambrano-Monserrate et al. (2020), there is a significant association between pandemic contingency measures and the improvement of air quality, clean beaches and reduction of environmental noise. There are also negative secondary aspects, such as reduction of recycling and the increase of waste compromising the contamination of physical spaces, where the greatest waste and reduction of recycling are negative side effects of COVID-19.

According to Fattorini and Regoli (2020), long-term air quality data correlated significantly with cases of COVID-19 in 71 Italian provinces (updates on April 27, 2020), providing further evidence that chronic exposure to contamination atmospheric exposure may represent a favorable context for the spread of the virus. For Sofo and Sofo (2020), regardless of the covid-19 pandemic, there is an untapped potential for domestic plants and gardens, which can impact environmental result, people awareness and market trends. According to the authors, home gardens can provide a small-scale approach to the sustainable use of natural resources, leading to self-sufficiency, self-regulation, sustainability and environmental protection. Positive environmental effects are likely to be temporal, but can serve as an example of changes in society's way of life. In this scenario, Sarkis et al. (2020), present a new existing link in a window of opportunity opens up to accelerate

population awareness, after the covid-19 pandemic, toward broader sustainability transitions. One of the positive consequences of the mobility restrictions imposed to curb the spread of covid-19 has been a reduction of more than 5% in global greenhouse gas emissions. However, in order to comply with the Paris Agreement and thus limit global warming less than 2degree centigrade relative to pre-industrial levels, it would be necessary to maintain a rate of emission reduction over the next few years similar to that seen in 2020, which has been the result of an exceptional situation. Given that the reduction in emissions in 2020 has occurred at the cost of a drastic fall in economic activity which has worsened living conditions, it is desirable that other factors should be the driving forces behind the fight against climate change in the future (Murillo, 2020).

As a result of the covid-19 pandemic, heightened population awareness has been amplified by the perception of the benefits of living in a cleaner world. The reduction in pollution during the weeks of full lockdown allowed many citizens to see first-hand the increased quality of life and well-being that comes with breathing cleaner air. In this regard, a study conducted in China shows that, in cities that experienced the greatest reduction in air pollution during the wave of coronavirus in February and March 2020, citizens' interest in environmental issues increased to a greater extent and more measures considered green were adopted in the following months (Kahn et al. 2020).

The authors point of views is mostly base on the negative population awareness as a result of covid-19 pandemic on the atmosphere.

Muhammad et al. (2020), the blockade due to covid-19 has drastic effects on social and economic fronts, however, this blockade also has some positive on the environment. Still, according to the authors, data released by NASA (National Aeronautics and Space Administration) and ESA (European Space and Agency) indicates that pollution in some of the epicenters of covid-19, such as Wuhan, Italy, Spain and USA, has been reduced by up to 30%. The study by Wang and Su (2020) highlights that the covid-19 pandemic reduced the concentration of nitrogen dioxide (NO2) in the atmosphere. Lal et al. (2020), noted that there was a sustainable reduction in the level of NO2, a low reduction in carbon monoxide (CO) and a low to moderate reduction in the optical depth of the aerosol, in the main hot spots of the covid-19 outbreak during February-March 2020, which can also be attributed to mass blocks. In this scenario, the study by Bashir et al. (2020) indicates that environmental pollutants such as PM10, PM2.5, SO2, NO2 and CO have a significant correlation with the covid-19 epidemic in California, just as it becomes relevant to encourage regulators to promote changes in environmental policies, because controlling the source of pollution can reduce the harmful effects of environmental pollutants.

From Hsu et al. (2020), many lessons learned will serve as a model for dealing with future pandemics, but a new sustainable model is needed for the immediate future quarantine policies have led consumers to increase their demand for online shopping for home delivery. Consequently, the organic waste generated by households has increase, also, food purchased online shipped packaged so that inorganic waste also increased (Zambrano-Monserrate et al. 2020).

In this context, sustainable consumption has been the subject of several scientific studies. For Baier et al. (2020), the constant increase in sustainable consumer behavior leads companies to strengthen their efforts to become socially and economically more sustainable, as sustainability offers developed for example through the recycled materials, circular business models, as well as adapted product, ranges with fewer fashion cycles.

According to Lo and Liu (2018) for efficient, sustainable consumption, the disposal and separation of domestic solid waste, as well as recycling is essential for the local community.

About inputs and natural resources, Rauf et al. (2020) point out that energy consumption in the high-tech industry and economic growth deteriorates environmental quality. Still, financial development and consumption of renewable energy have favorable effects on the environment. The research by Liu and Song (2020) highlights that producing more food with limited water resources, as well as improving the efficiency of water use, is an urgent task, especially in arid and semi-arid areas with fragile ecosystems and severe water shortages. O'Brien and Bringezu (2017), on the other hand, report that the levels of wood consumption have increased considerable in recent years, being considered sustainable forest management practices, aiming at

changes in the terrestrial system and the global distribution of common good resources, so that consumption levels are link to sustainable supply capacity.

In this context of global covid-19 pandemic, sustainable development is considered a key concept and solution in the creation of a promising and prosperous future for human societies (pirous et al., 2020b), where sustainable consumption must be global policies (Cohen, 2020), since the maintenance of natural resources must be sustainable so that the next generations have their needs met (Severe et al., 2018).

Without ignoring the fact that the pandemic has adversely affected the lives of people all over the world, one of the most promising covid-19 developments, as it relates to sustainable consumption, is the pandemic effect on household consumption pattern (Blundell et al., 2020). People consumed less and people consumed differently. This behavior led to exponential shifts in infrastructures (Schaltegger, 2020). Some general trends are now known about the change in consumption patterns during the pandemic. When the pandemic began, the widespread fear of covid-19's consequences, namely death, and anxiety of illness, led to panic buying at supermarkets for stockpiling (Naeem, 2020). After the 1st month of the pandemic, one of the most visible indicators of consumer behavior change was adopting cautious approaches in buying habits (Mehta et al., 2020). For example, people limited their major purchases to items that fulfilled basic needs (Hobbs, 2020) and avoided unnecessary purchases of luxury goods (Tuncer, 2020).

Lockdowns also discouraged going-out, but online shopping continued, implying a strong desire for consumption (Briggs et al., 2020). Similarly, people travelled less, in 2020, the airline industry suffered a significant drop in passenger air transport demand, threatening many airlines' viability, especially international travel, because passengers perceived a heightened risk than domestic fight routes (Forsyth et al., 2020; Matiza, 2020). Although it is remarkable that covid-19 led to a decrease in consumption and discarbonized the world economy (Perkins et al., 2021), these new consumption patterns occurred against the backdrop of the millions that lost their jobs and, as a consequence drastically affected world economies (Duffin, 2020). As a consequence of the change mentioned above in consumer's consumption behaviors, there have been unprecedented change to many supply chains. For instance, the sudden increase in medical-related product demand resulted in massive out-of-stcoks items (Anholon and Rampasso, 2020).

In the agricultural and food industries domain, the supply chains were also disrupted by current consumption patterns (Kerr, 2020). Likewise, the actual demand for fresh food on e-commerce platforms surpassed supplies' capacity to deliver (Hao et al., 2020). In response, supply chain adjusted to these new conditions, but not without problems. There were price increase, shortage of supplies, and general logistic system issues (Guo et al./ 2020). According to Free and Heamovic (2020), many disruptions will continue to be present for producers and consumers up and down supply chains. In the best-case scenario, the overall effects will be transitory from an economic approach (Wang et al., 2020).

The sustainable development goal (SDGs) set the year 2030 to tackle major global and social environmental crisis. A noteworthy feature of the SDGs is that many relate to responsible consumption, with SDG 12 directly involving sustainable consumption. The sustainable development goal 12 states:" to ensure sustainable consumption and production practices necessarily entails to respect the biophysical boundaries of the planet and to reduce current global consumption rates in order to fit with the biophysical capacity to produce ecosystem services and benefits (United Nation Environment Program, 2020). The covid-19 global pandemic has drastically shifted the landscape of sustainable consumption, and the anticipated future impacts are not well known (Executive Secretary of the Economic Commission for Latin America and the Caribe (ECLAC), 2020).

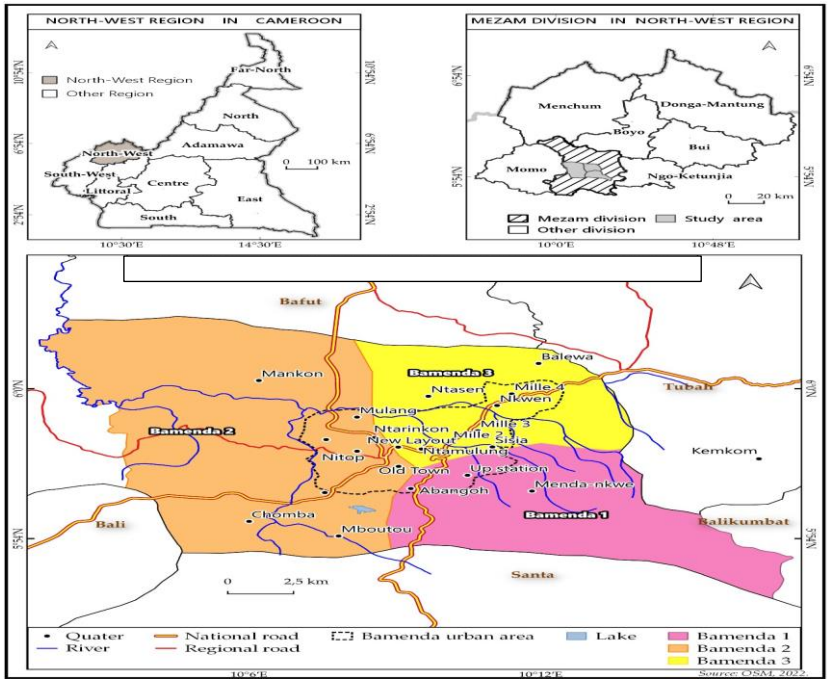
MATERIALS AND METHODS

Location of the study area

The study covers the three health districts in Bamenda (Bamenda I, II, and III) in the Mezam division of the North West Region of Cameroon corresponding to the seven villages; Bamendakwe, Nkwen, Mankon, Chomba, Nsongwa, and Mbatu. Bamenda, also known as Abakwa and Mankon town, is a city northwest of

Cameroon and capital of the North West Region, located 366 km (227 miles) north-west of the Cameroonian Capital, Yaounde. Bamenda is located between latitudes 5˚ 57'34.92'' North of the equator and longitude 10˚ 08'45.49'' East of the Greenwich Meridian. It lies at an average altitude of 1258 meters above sea level. Bamenda is bounded to the west by the Momo Division. Within Bali Sub-Division respectively. To the north, it is flanked by Bafut Sub-Division, to the northeast by Tubah Sub-Division and to the south by Santa Sub Division. Within Bamenda, there are three health districts; Bamenda I (Bamendakwe), Bamenda II (Mankon, Mbatu, Nsongwa and Chomba) and Bamenda III (Nkwen and Ndzah) (MINISANTE, 2019).

Figure 1: Geographic location of the study area (Bamenda health district)



Source: Administrative map of Cameroon, 2014: OSM, 2022

The climate of Bamenda health district is the tropical savanna climate with a long summer wet season of about 8months that is from March to October and a short dry season from November to February which is often warm and cloudy. These climatic conditions favor the growth of agricultural products such as coffee, maize, cocoyam's, hides. Pop, (2005). According to the statistics provided by the United Nations World Urbanization prospects, 2021, the total population of Bamenda health district is 553,000 inhabitants. Occupying an area of about 17,300km2. The population is composed of natives and migrants from different regions of the country seeking for job opportunities in the city. The population is distributed in to three health districts such as Bamenda 1 health district, Bamenda 11 health district and Bamenda 111 health district. The settlement of the population in the neighborhoods was based on tribal or cultural identity. The rural areas of Nkwen which is Bamenda 111 health district are mostly indigenous people from Tikar. These populations live in the spirit of culturalism and religious tolerance.

Data Collection and Management

Mixed research approached was used to collect information in the form of data for this study. Both qualitative and quantitative data tools were used as primary data collection tools to generate data for this study. Primary data were obtained through field observations, questionnaires, and interviews. The purpose of the field observation was to assess the population perceptions of Covid-19 pandemic and its implications on health districts activities in Bamenda. Interviews were also conducted with health personnel and authorities. The administration of questionnaires allowed for the collection of reliable data for this research in order to assess the population perceptions toward covid-19 and its impacts on activities in Bamenda.

In this research work, the target population is all the population living in Bamenda health districts and the formula used was S = Z (T). Where; S = Sample size, Z = selected percentage value (0.5), T = Total population

(553,000). Therefore, S = 0.5/100 (553,000) = 3.72. From the calculation, the sample size obtained for this study is 307 peoples. The collected data was entered into a spreadsheet by using the Statistical Package for Social Sciences (SPSS) version 2.0. Descriptive and space-related techniques were used in this analysis to transform and aligned the data collected through narratives.

RESULTS

Population perception on energy consumption

Here, the researcher investigates the perceptions on electricity consumption, fuel wood consumption and gas consumption. The perceptions were facilitated with the used of the likert scale measurement as presented in table 1.

Table 1: Population perception of energy consumption in Bamenda health districts

Variables	Scale	Bamenda I		Bamenda II		Bamenda III	
		F	%	F	%	F	%
Increase energy consumption	A	75	83.33	89	80.91	77	77.00
	SA	15	16.67	21	19.09	23	23.00
Increase use of biomass fuel	A	26	28.89	25	22.73	16	16.00
	SA	49	54.44	68	61.82	66	66.00
	D	15	16.67	17	15.45	18	18.00
Reduced gas demand	A	29	32.22	29	26.36	34	34.00
	SA	47	52.22	67	60.91	55	55.00
	D	14	15.56	14	12.73	11	11.00

SOURCE: fieldwork, August 2021

Increase in energy consumption

The COVID-19 induced lockdown had a significant impact on electricity consumption patterns in Bamenda health district. The pandemic has affected the electricity sector considered one of the imperatives for modern societies by altering the supply and demand of energy, since most residents have remained in either passive or active home quarantine. Electricity consumption can be considered an important indicator of economic fluctuations and during the pandemic can be monitored to gauge the economic impact of the virus. The COVID-19 lockdown measures have caused an increase in household electricity consumption since everyone is present at home throughout the day and night. Due to many mouths to feed, and the decline in gas supply, people prefer to use electric pot in cooking, electric heater for heating water, electricity for home working, increase levels of television watching, hence this increase is observed through high electric bills. Whereas, electricity demand in the service, commercial, and industrial sectors decreased because of lockdown policies. Therefore, temporal electricity-related data can offer insights in to the effect of the COVID-19 pandemic and associated mitigation policies.

Based on table 1, the population of Bamenda health district point of view about increase in energy consumption during covid-19, it shows that according to the respondent reactions in the health areas, that is in Bamenda 1health area, 83.33% agree that there is an increase in energy consumption during the lockdown of covid-19, 16.67% strongly agree. In Bamenda II health area, 80.91% agreed and 19.09% strongly agree and in Bamenda III health area, 77.0% agree, and 23.0% of the respondent strongly agreed that there is an increase in

energy consumption (Household energy) in Bamenda health district. The table below shows the statistics on energy produced from the eneo electricity plant in Bamenda health district located at Ntarikon in the year 2019 and 2020. That before the covid-19 in Bamenda health district and within the covid-19 in Bamenda health district.

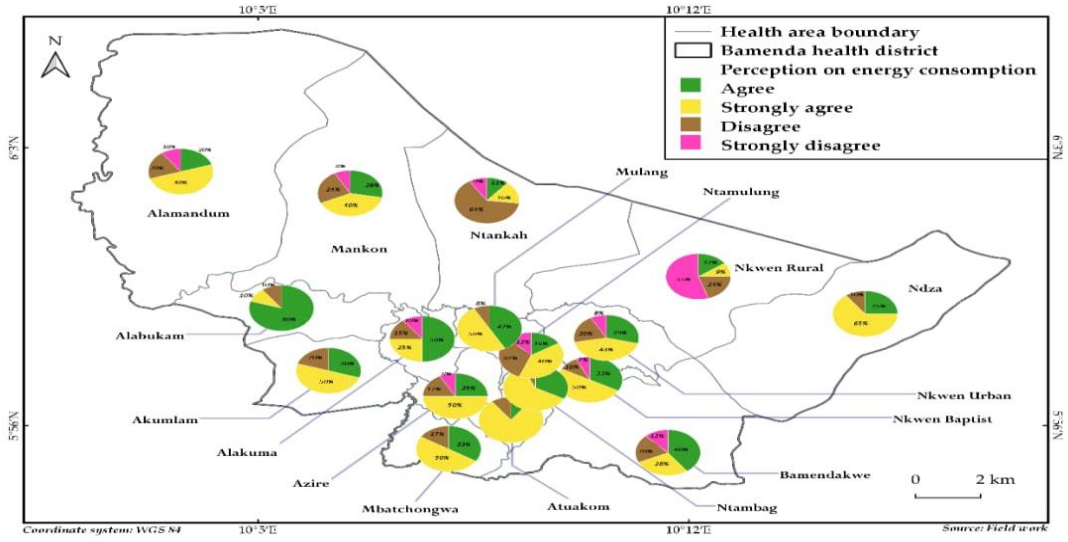
Table 2: Energy produced at the power plant in Bamenda health districts in kWh

Months	2019	2020
March	1,068,846/kwh	2,035,902/kwh
April	853,221/kwh	971,541/kwh
May	907,116/kwh	1,209,488/kwh

SOURCE: fieldwork, 2020

From table 2, it is observed that before the covid-19 outbreak in the study area, that is in 2019, in the month of March, the total quantity of energy produced was 1,068,846/kwh, in the month of April, the total produced was 853,221/kwh and in May, the total produced was 907,116/kwh. In the 2020 with the pandemic presence in the study area which was accompany with lockdowns in the same months, it was observed that in March 2020, the total quantity of energy produced witnessed a slight increase to 2,035,902/kwh. In the month of April, there was also a small increase in energy production to 971,541/kwh and in the month of May, the total of energy produced was 1,209,488/kwh. With these statistics, it can be concluded that there was an increase in energy consumption during the lockdown in Bamenda health district and was mostly by home and health areas consumption since economic, commercial and offices were in a closed up. Figure 2 below illustrates the population perception of covid-19 effect on increase in energy consumption in Bamenda health districts.

Figure 2: population perception of covid-19 effect on increase in energy consumption



SOURCE: fieldwork 2021

Figure 2 above shows the population perception of the effect of COVID-19 pandemic on increase in household energy consumption in Bamenda health districts. Health units were randomly chosen in the health district in order to evaluate their degree of perception and it occurs as follows; in Alakuma, 50% agree that there is an increase in energy consumption as a result of covid-19 in Bamenda health district, 25% strongly agree, 15% disagree and 10% strongly disagree. In Aalandum health area, 20% agree, 50% strongly agree, 20% disagree and 10% strongly disagree. In Atuakom, 29.4% agree, 41.2% strongly agree, 17.6% disagree and 11.8% strongly disagree. In Azire health area, 25% agree, 50% strongly agree, 16.7% disagree and 8.3% strongly

disagree. In Bamendakwe, 40% agree, 28% strongly agree, 20% disagree and 12% strongly disagree. In Mankon, 28% agree, 40% strongly agree, 24% disagree and 8% strongly disagree. In Mbatchongwa, 33.3% agree, 50% strongly agree, 16.7% disagree. In Mulang, 41.6% agree, 50% strongly agree, and 8.4% disagree. In Ndza, 25% agree, 65% strongly and 10% disagree. In Nkwen Baptist, 33.3% agree, 50% strongly agree, 10% disagree and 6.7% strongly disagree. In Nkwen Urban, 28.6% agree, 42.9% strongly agree, 20% disagree and 8.5% strongly disagree. In Ntambag, 33.3% agree, 60% strongly agree, 6.7% disagree. In Ntamulung, 16% agree, 40% strongly agree, 32% disagree and 12% strongly disagree. In Ntankah, 30% agree, 50% strongly agree and 20% disagree. In Nkwen rural, 17% agree, 9% strongly agree, 24% disagree and 50% strongly disagree. In Ntankah, 51% disagree, 30%strongly agree, 11% agree and 8% strongly disagree. According to the responses from the respondents, it can be concluded that there is an increase in household energy consumption in Bamenda health district as a result of the effect of covid-19 thereby causing more financial problems on the population.

Increase in the consumption of biomass fuel

The coronavirus pandemic has disrupted life. It is important not to lose sight of the fact that the coronavirus exist on top of many underlying health, social, economic inequalities and vulnerable groups. With the coronavirus pandemic outbreak, household around Bamenda health district without access to clean cooking energy services could be more adversely affected by the immediate and long-term effects of covid-19 containment measures and by the disease itself. There is an unprecedented consensus that the production and use of biomass fuels (wood, charcoal, agricultural by-products, and dung) during covid-19 has increase due to financial issues and these biomass fuels are the main contributor of indoor air pollution. The levels of biomass fuel consumption have increased considerably during the period of COVID-19 pandemic in Bamenda health district due to large family size to feed since everyone is available at home due to covid-19 prevention measure, limited finances for the purchase of cooking gas, cheap purchases of firewood, charcoal. Therefore, sustainable forest management practices need to be improved upon at changing the terrestrial system and the global distribution levels linked to sustainable supply capacities. According to the respondent point of views in Bamenda I health area, 28.89% agree that the rate of biomass fuel consumption like firewood has increase during covid-19 pandemic period, 54.44% strongly agree, 16.67% disagree. In Bamenda II health area, 22.73% agree, 61.82% strongly agree, 15.45% disagree and in Bamenda III health area, 16.0% agree, 66.0% strongly agree and 18.0% disagree.

Reduction in the demand for petroleum products

In Bamenda health districts, the demand for petroleum products is believed to have greatly decline because movement were restricted and so car owners were no longer buying gas since they cannot travel or go out seeking for leisure due to home confinement by the covid-19 pandemic prevention measures. Due to slowdown in economic activities especially production by local factories, it has also greatly affected the demand for petroleum gas and oil which is used for the production of goods and services. Furthermore, in the domain of fuel gas demand by household, its demand has really dropped since most people prefer fuel wood kitchen during the lockdown since the quantity of food to cook has increase, petroleum gas stations were closed and loss of jobs made access to money for purchasing petroleum gas difficult. According to respondents' perception on the fall in demand for petroleum oil, gas and fuel, it shows that in Bamenda I health area, 32.22% agree, 52.22% strongly agree, 15.56% disagree. In Bamenda II health area, 26.36% agree, followed by a 60.91% who strongly agree, and a 12.73% who disagree. And in Bamenda III health area, 34.0% agree, 55.0% strongly agree and 11.0% disagree. Table 3 shows clearly the yearly sales of petrol (supper), diesel (gasoil), and kerosene at the Ola Petrol station located at city chemist in the year 2018, 2019 and 2020.

Table 3: products quantity of sales

year	**petrol**	**gasoil**	**Kerosene**
2018	99,840 litters	1,129,440 litters	128,544 litters

2019	97, 032 litters	1,204,944 litters	151,652 litters
2020	72,774 litters	873,090 litters	82,826litters

SOURCE: field work 2021

From table 3, it shows that by the end of 2018 that is before the occurrence of the pandemic, the total sales of supper were 99,840 litters, gasoil was 1,129,440 litters and that of kerosene was 128,544 litters. And by the end of 2019, the sales of supper drop to 97, 032 litters, that of gasoil was 1,204,944 litters and the sales of kerosene was 151,652 litters. In 2020, the total quantity of sales of super was 72,774 litters, gasoil was 873,090 litters and kerosene were 82,826litters. This decrease in the demand for petroleum products is due to the movement restrictions and the closure of economic activities.

Population perceptions of covid-19 on biodiversity

Respondents' perception on the effects of COVID-19 on biodiversity was also sampled and the results presented in table 4.

Table 4: population perception of covid-19 on biodiversity in Bamenda health district

Variables	Scale	Bamenda I		Bamenda II		Bamenda III	
		F	%	F	%	F	%
Increase biodiversity loss	A	26	28.89	25	22.73	16	16.00
	SA	49	54.44	68	61.82	66	66.00
	D	15	16.67	17	15.45	18	18.00
Food systems	A	40	44.44	32	29.09	35	35.00
	SA	43	47.78	76	69.09	63	63.00

Source: Fieldwork, August 2021

This table contain variables such decrease in biodiversity loss, food systems. These variables were measured using the likert scale measurement. The following paragraphs shows more elaboration of each variable.

Increase in biodiversity loss

This can be seen in the sense that, during COVID-19 pandemic in the health districts in Bamenda, the exploitation of wildlife resources increased as protected areas (PAs) staff expected to continue with anti-poaching patrol were not able to be on duty, vulnerable species were not also guarded. The effects of the lockdown and other pandemic associated factors caused conflicts and destruction of natural resources. For instance, conflicts arise when the behavior of local people changes because of difficult livelihoods to farm and food insecurity leads to increased poverty among the local communities. Increase in urban rural migration led to undue pressure on natural resources in reserved areas. Also, households that have lost their breadwinners in the course of the pandemic will be alone without an option for meeting their subsistence. Besides, natural resources extracted for traditional medicines on a quest to find treatments for the pandemic and related chronic diseases by traditional healers, concoctions made from parts of wild animals and some forest trees, this method of treating pandemic can cause harm to the resources. According to the population, it indicates that in Bamenda I health district, 28.89% of the responds agree, 54.44% strongly agree, 16.67% disagree on the point that there is no reduction in biodiversity loss. In Bamenda II health district, 22.73% agree, 61.82 strongly agree and 15.45% disagree and in Bamenda III health district, 16.0% agree, 66.0% strongly agree and 18.0% disagree on the point there is no reduction in the loss of biodiversity level.

Food systems

The initiatives of governments like lockdown and quarantine in response to the public health emergency may heavily intrude on the individual choices, daily habits and behaviours of citizens. COVID-19 has brought changes in consumers' behavioural patterns regarding consumption across Bamenda health district. It has already caused changes to consumer behavior and introduced long-lasting effects as well, changes in people's lifestyles, buying behavior and supply chain system of businesses result in new events for example, and retailers are closing their doors, and consumers are looking at products and brands through a new lens. Given the social distancing in new normal condition, consumer's habits are getting used to the new environment and circumstances.

Furthermore, the outbreak of COVID-19 has caused consumption to fall dramatically and the saving rate spiked. Bamenda health district has experienced the sharpest drop in consumption levels as observe in many houses and the rate of buying in the market. Several factors can be responsible for these consumption patterns. First, the fall in disposable income and the job losses may have induced household to cut spending. Second, household may have wanted to increase their saving buffer for precautionary reasons, being move unsure about the evolution of their economic situation or because they perceive a higher health risk. Third, lockdown policies prevented some expenditures, generating forced saving. Fourth, the risk of infection may have prevented households from consuming certain types of goods and services that requires social contacts. All these factors have likely played a role at the height of the pandemic crisis, with different intensities for each spending category and for different types of households and may continue to characterize in the near future. Findings shows that, in Bamenda I health area, those who agree were 44.44%, 47.78% strongly agree and 7.78% disagree. In Bamenda II health area, 29.09% agree, 67.09% strongly agree and 1.82% disagree and in Bamenda III health area, 53.0% agree, 63.0% strongly agree and 2.0% disagree.

Increase in water consumption

The impacts of the coronavirus on the water sector are still emerging, but one area that has come to the fore is the effect on municipal water demand (table 5). It has been observed in the study area that residential water demand has increased while non-residential demand has decreased during the covid-19 lockdown. These changes are, in part, due to the simple fact that people are doing more at home during the coronavirus lockdown measure like cooking, washing dishes, and washing of cloths, flushing toilet, and showering, frequent house cleaning and at the restaurants. Moreover, while business is up for a handful of sectors-like hospitals and some food production company like the breed industries. Other important water-using sectors of the economy have slowed or shut down like the building and construction sectors.

Table 5: Population perception of covid-19 on increased in water consumption in Bamenda health districts

Variable	Scale	Bamenda I		Bamenda II		Bamenda III	
		F	%	F	%	F	%
Increased water consumption	A	29	32.22	45	40.91	42	42.00
	SA	44	48.89	41	37.27	33	33.00
	D	15	16.67	17	15.45	18	18.00
	SD	2	2.22	7	6.36	7	7.00

Source: Fieldwork, August 2021

This increase in water usage is observed through digging of wells by many individuals in their compound, and the frequent seizure of public and private taps in Bamenda health district. According to the population in Bamenda health district, it shows that in Bamenda I health area, 32.22% agree, 48.89% strongly agree that

there is an increase in water consumption as a result of covid-19 and 16.67% disagree. Followed by 40.91% who agree, 37.27% who strongly agree, and 15.45% who disagree and 6.36% who strongly disagree in Bamenda II health area. 42.0% who agree, 33.0% who strongly agree, 18.0% who disagree and 7.0% who strongly disagree in Bamenda III health district.

SUMMARY AND CONCLUSION

Population perception of covid-19 pandemic has offered a grounded means for understanding natural resource management in Bamenda health districts during the pandemic outbreak. The survey data revealed that there was in increase in energy consumption as observed through the high bills during the period of home confinement for the disease prevention. The population also perceived that it was very difficult to manage natural resources like the environment due to high rate of waste disposal which comes as a result of increase in waste generation since foodstuffs were mostly sold in plastic and in packages and the level of waste collection by the council officials was very limited due to movement restrictions. The levels of water consumption at home increased resulting to frequent tap water seizure and the consumption of unsafe water sources such as boreholes, streams, rivers which are sources of waste deposition by many and runoff. The survey data reveals that the rate of herbs exploitation and consumption was on the rise since the population believed that herbs were remedy to the pandemic thereby resulting to over exploitation and consumption without prescription from the medical center.

Covid-19 has brought about negative impacts of natural resource management in Bamenda health districts which is an indication that sustainable measures should be put in place to effectively manage natural resource for future generation. Efforts to address environmental challenges must be integrated into pandemic response and recovery strategies. This requires collaboration among stakeholders, including local communities, government agencies, and conservation organizations, to ensure a resilient and sustainable future for Bamenda's natural resources.

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