

The Urbanization Of The City Of Bukavu And Its Involvement In The Socio-Economic Situation Of The Urban Population, South Kivu, Democratic Republic Of Congo

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Abstract – This study examines the urbanization of the city of Bukavu and the implications for the socio-economic situation of the inhabitants. It aims to determine the impacts of increasing urbanization on the socio-economic life of the population in order to propose strategies to reconcile urbanization and the improvement of the living conditions of the urban population. The methodology combined field observations, household survey and interviews. The aspects covered are mainly household characteristics and socio-economic characteristics. The survey covered a sample of 150 households for the entire city in terms of 50 households per municipality. The questionnaire was submitted to the public from March to April 2020. The survey results show that the population of this city lives in difficult conditions with precarious housing whose plots do not meet the standards, difficult access to drinking water with dramatic consequences on the health of the population, difficult access to electricity, the virtual absence of public hygiene services... From the statistical analysis of Chi-square that we carried out, it follows that there is no relationship between the variables tested including membership in a municipality and other variables that have been the subject of this analysis. This conclusion is made by the fact that the p-values obtained at the end of this test are well above 0.05 as the results demonstrate. The impacts of urbanization are clearly negative in this city, which needs to be given special attention to reconciling urban development with improving the living conditions of the urban population.

Keywords – urbanization, socio-economic, urban population, household, south kivu, RDC

I. INTRODUCTION

One of the most striking phenomena of these days is undoubtedly the speed of the process of urbanization on a global scale. This urbanization is due to the population growth of the population living in the agglomerations. In 2014, 54% of the population was urban, with a higher proportion in developed countries. Africa and Asia are urbanizing faster than other regions, and along with Latin America, they account for more than 90% of the world's urban population [1]. The reference [2] noted that 59.6% of the world's urban population lives in developing countries and the trend will increase. The population explosion and mobility are

obviously at the root of the brutal urban growth [3]. In this context, the UN HABITAT 2016 Report, entitled "For a Better Urban Future", states that the DRC is experiencing rapid urbanization, with exceptional rates (more than 40% in 2014 compared to 26.4% for the previous decade and almost the same rates for future projections, i.e. in 2024 and 2034). Urban challenges are also crystallizing around the acceleration of rural exodus, largely due to conflict and insecurity in many parts of the country. Natural population growth is also important, with high birth and fertility rates (5.1% and 7.7% for Kinshasa, for example). Population growth in the city of Bukavu is a function of rural exodus and natural population growth within the city. Its population is changing exponentially. In fact, over a period of just over 100 years (1909-2012), the number of urban population in Bukavu increased from 114 to 800574, or nearly 6000 times the original population (Provincial Statistics Institute, 2012), 976372 inhabitants in 2016 and finally 1037645 inhabitants in 2018 (INS, 2019). Like sub-Saharan countries, people in the city of Bukavu live in precarious conditions [4]. Challenges faced by residents of the city of Bukavu include access to safe drinking water and sanitation [5]. Housing conditions in households, standard of living including access to safe drinking water, education, electricity, number of meals per day, access to sanitation services, primary health care, basic infrastructure, etc. are taken into account for this study in order to understand the links between increasing urbanization and the socio-economic situation of the inhabitants of the city of Bukavu. This study aims to determine the impacts of increasing urbanization on the socio-economic life of the population in order to propose strategies to reconcile urbanization and the improvement of the living conditions of the urban population. To our knowledge on this subject, there are few studies that link urban growth and its impacts on the urban population, which is why we hypothesize that the precarious socio-economic situation of the inhabitants of the city of Bukavu is due to the anarchic urbanization corollary of the rural exodus.

II. MATERIAL AND METHODS

Geographically located by the coordinates 2°3'S and 28°5'E, the town of Bukavu, the capital of the DRC's South Kivu province, is located at the southwestern end of Lake Kivu, which borders it against the highlands of the Kivu mountain range. It is bounded to the north by Lake Kivu, to the west by the Nyamuhinga River which forms its border with Kabare territory, and to the south by the Mudusa grouping in Kabare territory and to the east by the Ruzizi River. The city is separated from Rwanda by Lake Kivu, as well as by the Ruzizi River [6] cited by Lina in 2016. According to the reference [7], it has an area of 63 square kilometers, of which 43 square kilometers is land and 20 square kilometers occupied by the lake.

The town of Bukavu (Figure 1), the capital of South Kivu province, has existed for a hundred years and includes 3 municipalities, including the commune of Bagira consisting of 3 districts (Nyakavogo, Lumumba and Kasha; the kadutu commune which comprises 7 districts (Nkafu, Nyakaliba, Kajangu, Cimpunda, Mosala, Nyamugo and Kasali) and that of Ibanda composed of 4 districts (Ndendere, Panzi, Cahi and Nyalukemba) [8].

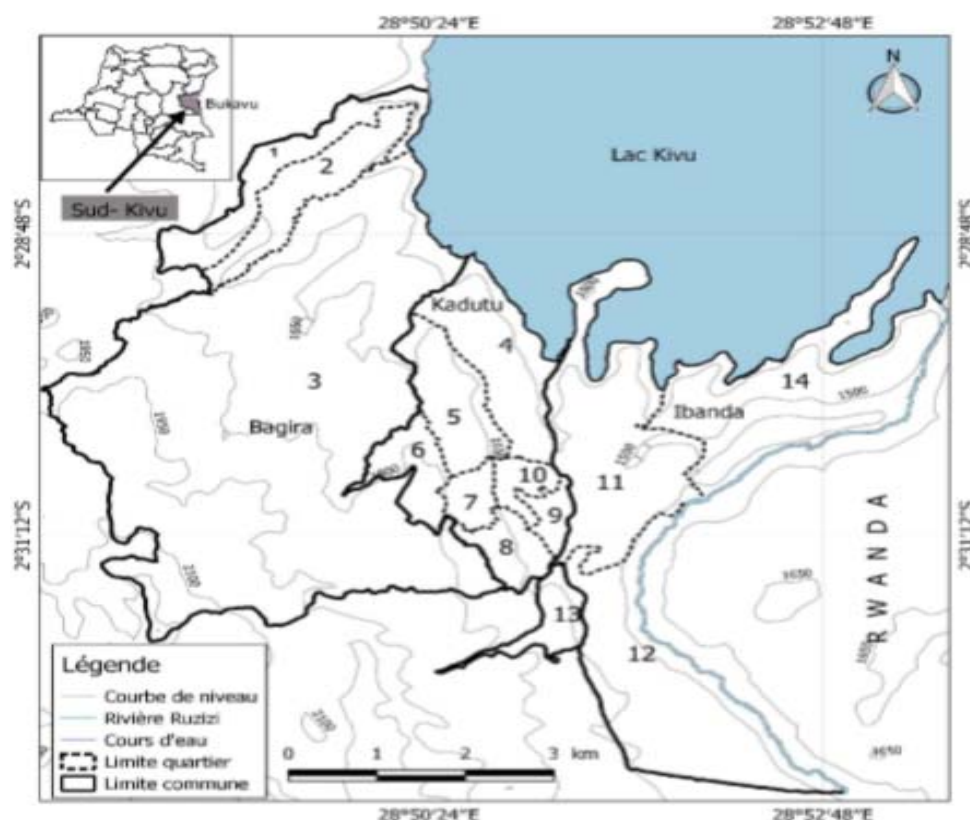


Figure 1: Location of the city of Bukavu and delimitation of the municipalities and districts that make up it. District names. 1: Nyakavogo, 2: Lumumba, 3: Kasha, 4: Nkafu, 5: Nyakaliba, 6: Kajangu, 7: Cimpunda, 8: Mosala, 9: Nyamugo, 10: Kasali, 11: Ndendere, 12: Panzi, 13: Cahi, 14: Nyalukemba [8].

2.1. Household survey

A survey questionnaire consisting mainly of semi-open questions was submitted to the target population in the three municipalities of the city of Bukavu. Household characteristics such as: household standings according to municipalities guided the selection of our sample. Thus, the target population was diverse in terms of age, education, gender, occupation, marital status, household size, etc. Thus, the sample included parents, lessors or tenants, or their children aged at least 20 years of age who were able to provide reliable information but who had lived in the area for at least two years. The data were collected on the field from March to April 2020. The raid on the field was conditioned by permission from the municipal authorities to carry out the investigation in peace. The fact sheet was provided to the respondent in order to retrieve it within 20 minutes or, if necessary, the resident was interviewed directly.

In addition to the survey questionnaire, the interview was also useful and mainly concerned people who cannot read or write. The interview also had the advantage of avoiding unanswered questions. The sample consisted of 150 households for the whole city, due to 50 households per municipality. Figure 2 provides a synthetic overview of the sample distribution.

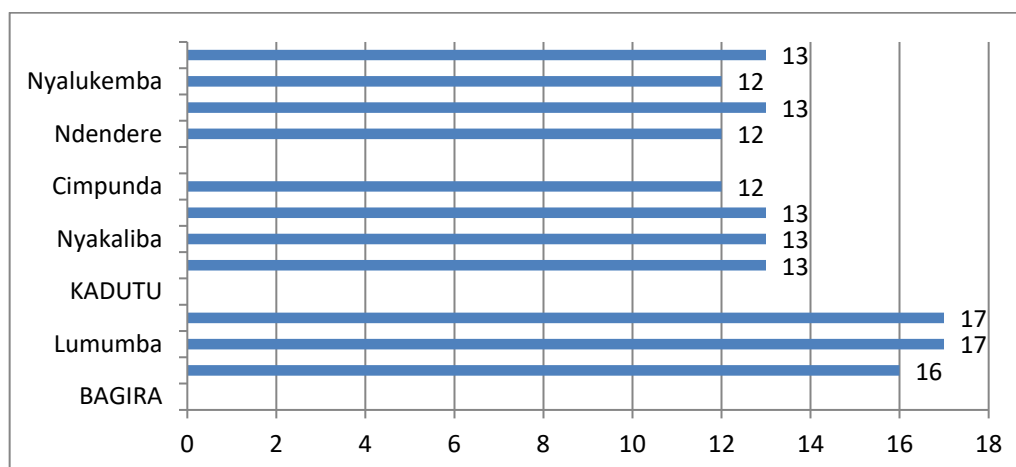


Figure 2. Dividing the sample by municipalities and then by districts: the names in capital letters represent the communes and those in lower cases represent the districts.

2.2. Data processing and analysis

The survey sheets were compiled, then the data were exploited and stored in the SPSS Version 16 software and the Excel spreadsheet was used to present the results in the form of tables and graphs. For each aspect, the analysis of the data consisted in the interpretation of the respondents' opinions. Proportions are determined by the calculation of percentages as follows:

$\% = Fo \times 100/Ft$, where Fo = observed frequency and Ft = total frequency of sample.

Cross-analysis of certain variables was carried out using SPSS version 16 software to identify possible dependencies between variables. For this, Pearson's Chi-square test was applied.

III. RESULTS

3.1. Household characteristics

Table 1. Gender and age of respondents per municipality

Gender of respondents (%)			Age of respondents (%)				
Municipality	Male	Female	20-30 years	31-40 years	41-50 years	51-60 years	More than 60 years
Kadutu	58	42	18	14	18	40	10
Ibanda	56	44	10	8	30	32	20
Bagira	64	36	12	24	26	20	18
Average	59.3	40.7	13.3	15.3	26.7	30.7	16

According to this table, it appears that 59.3% of respondents are men compared to 40.7% of women. In terms of the age of the respondents, 73.4% of those sampled are between 41 and 60 years of age or more than 60 years of sex combined, but with a high percentage of those aged 51 to 60 years, 30.7%, followed by 26.7% of those aged 41 to 50 years and 16% of those over 60 years, 15.3% are people aged 31 to 40 years and the lowest rate is 13.3% that concerns people aged 20 to 30 years. The 73.4% rate could be explained by the fact that it is people aged 41 to over 60 years who are supposed to have experienced so many events.

Table 2. Household size and marital status of respondents

Household size of respondents %					Marital status of respondents %			
Municipality	1-5 pers	6-10 pers	11-15 pers	More than 15pers	Married	Single	Divorced	Widower
Kadutu	28	32	24	16	60	28	2	10
Ibanda	32	42	14	12	58	30	4	8
Bagira	22	44	24	10	72	12	4	12
Average	27.3	39.3	20.7	12.7	63.3	23.3	3.3	10

The majority of the households surveyed are 6 to 10 people or 39.3%, followed by 27.3% of households with a size of 1 to 5 people, 20.7% having 11 to 15 people and a small number of households with more than 15 people or 12.7% of the households surveyed. Regarding the marital status of the respondents, 63.3% are married compared to 23.3% of single, 10% of widows or widowers and the low rate being that of divorced with 3.3%.

Table 3. Profession and level of education of respondents

Profession of respondents (%)						Level of education of respondents (%)			
Municipality	Agr	Trad	Offic	Techn	Stud	No	Prim	Second	Univ
Kadutu	12	36	18	22	16	16	22	38	24
Ibanda	6	32	28	24	14	12	24	38	26
Bagira	12	30	20	20	10	14	18	44	24
Average	10	32.7	22	22	13.3	14	21.3	40	24.7

*Agr : Agriculture *Trad : Trade *Techn : Technical *Non : None *Prim : Primary *Second :

*Offic : Official Stud : Student

Secondary *Univ : University

The average percentage of all three municipalities for the profession gives the highest rate of 32.7% of traders, followed respectively by 22% of respondents who do the jobs (which include masons, seamstresses, carpenters, plumbers, shoemakers, etc.) and 22% of civil servants in the civil service and the private sector salaried, students 13.3%, and the lowest rate being farmers and breeders 10% who correspond mainly to the respondents from the rural peripheries of the municipalities investigated. Regarding the level of education, the majority of respondents have a secondary education level 40%, followed by university executives 24.7%, those at the primary level 21.3% and a low rate of people who have not been to school 14%.

The results of the socio-economic characteristics of the households surveyed are presented in the tables below.

Table 4. The nature of the plot and whether or not the inner courtyard is present in the plot

Nature of the plot (%)			Whether or not the inner courtyard is present in the plot (%)	
Municipality	Private property	Tenant	Yes	no
Kadutu	56	44	24	76
Ibanda	54	46	42	58
Bagira	62	38	54	46
Average	57.3	42.7	40	60

The majority of respondents occupy plots whose property is private 57.3% against 42.7% of tenants. As for the presence or not of the inner courtyard, 60% of the plots do not have an inner courtyard compared to 40% of the plots with the inner courtyard. The presence of the inner courtyard depends on the size of the plot but also on the subdivision of the plot. This absence of the interior courtyards in the plots is justified by the smallness of the plots because the population needs to have at all costs a house in the city regardless of the conditions.

Table 5. Number of meals per day by municipality

Number of meals per day by municipality (%)			
Municipality	1 meal	2 meals	3 meals
Kadutu	14	58	28
Ibanda	18	48	34
Bagira	14	62	24
Average	15.3	56	28.7

The number of meals per day varies, most households surveyed have the possibility of having two meals per day or 56%, other three meals or 28.7% and a small number have only one meal per day or 15.3%. The number of meals per day reflects the purchasing power of households, the more the purchasing power in the household better it has the possibility of having more meals and vice versa.

3.2. Characteristics of socio-economic of household

Cross-treatment of survey results

In order to clearly understand the problem of the implications of urbanization in the socio-economic life of the urban population of Bukavu, we have conducted cross-analyses of the variables below.

Table 6. Relationship between belonging to a municipality and the mode of occupancy of the plot

Municipality Mode of occupation of the plot		Kadutu	Ibanda	Bagira	Total	
Size	Purchase	28	26	21	75	
	%	56%	52%	42%	50%	
Size	Inheritance	9	9	10	28	
	%	18%	18%	20%	18.7%	
Size	Renter	13	15	19	47	
	%	26 %	30 %	38%	31.3%	
Total		50	50	50	150	
		100%	100%	100%	100%	
Chi-square of Pearson : 2,303 dl = 4, p= 0,680						

In the municipalities that are the subject of our study, it is noted that two modes of plot occupancy are predominant, notably occupancy per purchase with 56% for Kadutu, 52% for Ibanda and 42% for Bagira; the cumulative is 50% for this category of plot occupancy, occupancy per rental comes in second place with 38% for Bagira, 30% for Ibanda and 26% for Kadutu; all making the accumulation of 31.3% and the last mode of occupancy of plot is inheritance with 20% for Bagira, followed by Ibanda and Kadutu with respectively the rate of 18% each and whose cumulative is 18.7%. With the p value greater than 0.05 ($p = 0.680$), there is no relationship between belonging to a municipality and the mode of occupancy of the plot.

Table 7. Relationship between belonging to a municipality and access to safe drinking water

Municipality		Kadutu	Ibanda	Bagira	Total
Access to safe drinking					
Size	Easy	17	22	24	63
%		34 %	44%	48%	42%
Size	Not easy	33	28	26	87
%		66%	56%	52%	58%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 2,135 dl = 2, $p = 0,344$					

This table shows that access to safe drinking water is not easy in all municipalities. This is observed by a percentage divided as follows: 66% in Ibanda, 56% in Kadutu and 52% in Bagira with a cumulative of 58%; a small proportion of households have easy access to this resource, including 48% for Bagira, 44% for Ibanda and 34% for Kadutu with a cumulative 42%. The near-high percentage of access to water in Bagira is justified by the fact that this municipality is more or less close to the source of supply of REGIDESO and the presence of some water supply in spontaneous neighborhoods. With the p value greater than 0.05 ($p = 0.344$), there is no relationship between belonging to a municipality and access to safe drinking water.

Table 8. Relationship between belonging to a municipality and the distance travelled to access drinking water

Municipality		Kadutu	Ibanda	Bagira	Total
Traveled distance					
Size	None	13	10	15	38
%		26 %	20%	30%	25.3%
Size	10m-50m	11	18	14	43
%		22%	36%	28%	28.7%
Size	60m-100m	17	15	14	46
%		34%	30%	28%	30.7%
Size	More than 100m	9	7	7	23
%		18%	14%	14%	15.3%

Total	50	50	50	150
	100%	100%	100%	100%
Chi-square of Pearson : 3.373 dl = 6, p= 0,761				

From the distance travelled, this table shows that many households are 60m-100m away in the following proportions: Kadutu 34%, Ibanda 30% and Bagira 28% with a cumulative of 30.7%; other households are 10m-50m away, 36% in Ibanda, 28% in Bagira and 22% in Kadutu with a cumulative of 28.7%; there are also households that do not make any distance in the proportions of 30% for Bagira, 26% for Kadutu and 20% for Ibanda with a total of 25.3% and finally a small proportion of households performs more than 100m distributed as follows: 18% for Kadutu and 14% for Ibanda and Bagira respectively with a cumulative of 15.3%. With the p value greater than 0.05 ($p = 0.761$), there is no relationship between belonging to a municipality and the distance traveled to access drinking water.

Table 9. Relationship between belonging to a municipality and the source of energy for lighting

Municipality		Kadutu	Ibanda	Bagira	Total
Source of energy for lighting					
Size	Electricity and solar panel	16	22	12	50
%		32%	44%	24%	33.3%
Size	Solar panel	13	10	11	34
%		26%	20%	22%	22.7%
Size	Oil lamp and torchlight	21	18	27	66
%		42%	36%	54%	44%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 5,361 dl = 4, p= 0.252					

The results of this table indicate that municipalities use energy for lighting in the following proportions: for the oil lamp and torchlight, Bagira has 54% of households, Kadutu 24% and Ibanda 22% with a cumulative of 33.3%, for electricity and solar panel, Bagira has 42% of households, Kadutu 32% and Ibanda 26% with a cumulative 33.3%; regarding solar panel Kadutu 44%, Bagira 36% and Ibanda 20% with a cumulative of 44%. With the p value greater than 0.05 ($p = 0.252$), there is no relationship between belonging to a municipality and the source of energy for lighting.

Table 10. Relationship between belonging to a municipality and the source of energy for cooking food

Municipality		Kadutu	Ibanda	Bagira	Total
source of energy for food cooking					
Size	Electricity and embers	14	10	16	40
%		28%	20%	32%	26.7%
Size	Embers	27	27	21	75
%		54%	54%	42%	50%
Size	Firewood	9	13	13	35
%		18%	26%	26%	23.3%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 3.274 dl = 4, p= 0.513					

With regard to energy for cooking food, the use of embers comes first, with 54% respectively for the municipality of Kadutu and Ibanda and 42% for the municipality of Bagira, the cumulative being 50%; the combined use of electricity and embers comes in second place including 32% for Bagira, Kadutu 28% and Ibanda 20% with a cumulative of 26% and finally the use of firewood with 26% respectively for Bagira and Ibanda and 18% for Kadutu and the cumulative making 23.3%. With the p value greater than 0.05 (p = 0.513), there is no relationship between belonging to a commune and the source of energy for cooking.

Table 11. Relationship between belonging to a municipality and the type of housing

Municipality		Kadutu	Ibanda	Bagira	Total
Type of building					
Size	Sustaible materials	12	16	11	39
%		24%	32%	22%	26%
Size	Half-sustainable materials	16	13	16	45
%		32%	26%	32%	30%
Size	House in planks	18	18	20	49
%		36%	36%	40%	37.3%
Size	Indigenous house	4	3	3	10
%		8%	6%	6%	6.7%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 1,820 dl = 6, p= 0.936					

The results relating to this table are as follows: plank houses occupy a predominant place: 40% for the municipality of Bagira, 36% respectively for Ibanda and Katutu with a cumulative 37.3% followed by halfi-sustainable houses of which 32% respectively for Bagira and Kadutu and 26% for Ibanda with a cumulative 30%; sustainable materials houses came in third place: 32% for Ibanda, 24% for Kadutu and 22% for Bagira and finally indigenous houses: 8% for Kadutu and 6% respectively for Bagira and Ibanda. With the p value greater than 0.05 ($p = 0.816$), there is no relationship between belonging to a commune and the type of dwelling.

Table 12. Relationship between belonging to a municipality and the type of latrines

Municipality		Kadutu	Ibanda	Bagira	Total
Type of latrines					
Size	Moderns	13	16	13	42
%		26 %	32%	26%	28%
Size	Indigenous or single hole	23	20	25	68
%		46%	40%	50%	45.3%
Size	Spill into canals and rivers	14	14	12	40
%		28%	28%	24%	26.7%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 1,187 dl = 4, $p = 0,880$					

The results in relation to the type of latrines are as follows: the native or single hole latrines are the majority in the study area, 50% for Bagira, 46% for Kadutu and 40% for Ibanda with a cumulative of 45.3%; modern latrines come second 32% for Ibanda and 26% respectively for Bagira and Kadutu with the accumulation of 28% and finally the latrines that discharge their faeces directly into the canals and rivers account for 28% respectively for Ibanda and Kadutu and 24% for Bagira with the cumulative of 26.7%. With the p value greater than 0.05 ($p = 0,880$), there is no relationship between belonging to a commune and the type of latrine.

Table 13. Relationship between belonging to a municipality and the presence or not of the public landfill

Municipality		Kadutu	Ibanda	Bagira	Total
Presence or no of landfills					
Size	Yes	8	13	6	27
%		16%	26%	12%	18%
Size	No	42	37	44	123
%		84%	74%	88%	82%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 3,523 dl = 2, $p = 0,172$					

The results of this table show that the city of Bukavu does not have public landfills, this is explained as follows: 88% of households in Bagira do not recognize the presence of a public discharge, 84% in Katutu and 74% in Ibanda, the cumulative being 82% and 24% in Ibanda are aware of a public discharge presence, 16% in Kadutu and 12% in Bagira, the cumulative being 18%. Since the p value is greater than 0.05 ($p = 0.172$), there is no relationship between belonging to a municipality and the presence or not of a public landfill

Table 14. Relationship between belonging to a municipality and the way household waste is managed

Municipality		Kadutu	Ibanda	Bagira	Total
Way household waste is managed					
Size	Compost	9	7	13	29
%		18%	14%	26%	19.3%
Size	Membership of the waste collection associations in the households	11	13	5	29
%		22%	26%	10%	19.3%
Size	Pirate landfills (rivers, canals and public places)	32	28	32	92
%		64%	56%	64%	61.3%
Total		50	50	50	150
		100%	100%	100%	100%
Chi-square of Pearson : 5.865 dl = 4, $p = 0.209$					

According to the way household waste is managed, it appears from this table that most households throw their household waste into pirate landfills 64% respectively for the municipality of Bagira and Kadutu and 56% for the municipality of Ibanda, the cumulative is 61.3%; other households joining household waste collection associations 26% in Ibanda, 22% in Kadutu and 10% in Bagira, the cumulative being 19.3% and finally another proportion make compost with their biodegradable household waste 26% in Bagira, 18% in Kadutu and 14% in Ibanda with a cumulative 19.3%. When asked how the latter category manages non-biodegradable waste, they say they throw it into the wild. Since the p value is greater than 0.05 ($p = 0.209$), there is no relationship between belonging to a municipality and the way household waste is managed.

IV. DISCUSSION

Access to safe drinking water is one of the serious problems facing the people of Bukavu over time despite the large freshwater reserves of the DRC in general and Bukavu in particular. The rate of water access is alarming. This corroborates the assertions of the reference [9] that the water crisis is not related to insufficient resources but to mismanagement. And the reference [10] adds that the water crisis is linked to poverty, regional disparities and inadequate management policies. Our results on access to water in our study environment are consistent with those of [11] according to which more than half of the population does not have easy access to safe drinking water. This pushes residents to move to other sources of untreated water: rain, lake, springs and rivers to make up for the shortfall of REGIDESO, the leading distribution and marketing company for drinking water in the DRC. With regard to the distance travelled to obtain water, it turns out that the proximity of the supply site or the presence of the tap in the plot does not justify easy access to water because there are recurrent shortages of water service by REGIDESO of up to a week or more. According to the statements of some respondents, even at the downtown level (Nguba for example), the population uses unsafe water commonly referred to as "Bizola" which means stagnant water. This attitude exposes populations to several risks including water-related diseases. The Provincial Health Inspectorate/Bukavu (IPS/Bukavu) in 2011 reported 6832 cases of cholera, including 36 deaths;

38336 cases of schistosomiasis, including 35 deaths; 7927 cases of typhoid fever, including 17 deaths; 12273 cases of bloody diarrhoea, including 5 deaths; 126962 of simple diarrhea including 303 deaths; and 38336 cases of amoebiasis, including 35 deaths. However, due to a lack of financial resources, a considerable segment of the population is willing to self-medicate, so many cases of disease or morbidity are not reported and are thus not listed in IPS statistics [5]. Electrical energy coverage is almost absent in our study area. This is due to the fact that the electricity supply network designed for the creation of the city has met with increasing demand following the population explosion. According to the results related to the electricity supply, most households use the oil lamp or flashlight for lighting. Among those who use solar panels exclusively are former subscribers to the National Electricity Corporation (SNEL) but due to the poor service provided by this company, they preferred to abandon the latter to avoid flat bills from that company. These results are similar to those of [12] which state that the anarchic urbanization characterizing the gamous quarters in the developing country is a factor that determines the problems of electricity coverage.

Half of the households surveyed use embers for cooking food, which has a significant impact on the woodlands of both the city's peripheries and wood forest resources in all the province's territories because the city depends on these territories for this vital resource.

More than half of the respondents have private plots that they acquired by purchase but do not meet the conditions of a plot according to the spirit of the colonial-era development plan in terms of area and mode of use of the said plot because the urban authority is not at all involved in the process of granting the plots and therefore the transaction involves the buyer and the seller and the most striking fact is the construction on unsuitable sites. The results of the reference [13] have reported a similar situation where it shows that most cities are facing this problem. In his study, he shows that some cities in Ngaoundere in Cameroon have developed in areas not aedificandi, notably on steep slopes, due to a lack of financial resources on the part of the inhabitants, but also by a desire to group by ethnic affinity. He insists that the inhabitants of the city are driven by the desire to have a home regardless of the location and topographical conditions of the plot. In our study area, in addition to the lack of financial resources and ethnic grouping, there is the concern to have at all costs a house in the city due to the difficult conditions prevailing in rural areas (insecurity, declining fertility of the fields, etc.). This anarchy violated the 1957 City of Bukavu Land Use Plan for standards based on minimum plot area, road front width and maximum built-up area. The results and field observations show that the majority of plots are less than 10m/10m long and therefore the built area is 4/4 in most cases as demonstrated [14] so that more than half of the plots or 60% have no inner courtyard. Trade is the main activity in our study area because practiced by the majority of the population surveyed. However, most do so informally because they have no other sources of income, and this is consistent with the results of [15] that the proliferation of informal economic sector activities is reduced to a situation of unemployed, which is a survival strategy for urban dwellers. It insists that they are exploiting the niches left vacant by the government unable to meet certain demands of the population. As a result, many informal activities may emerge outside the formal institutional and regulatory framework of the economy. We have inventoried 4 modes of housing including buildings made of sustainable, semi-sustainable materials, planks and finally native buildings. In general, plank buildings are the majority in the city of Bukavu according to the results of our surveys but referring to those obtained by [5] who ranked the households of the commune by standing, it shows that the commune of Ibanda is full of households of high and medium standing, Bagira is full of households average standing and low standing and finally Kadutu is full of households mostly low standing. Nevertheless, through our observations, in the commune of Ibanda, in addition to these two types of standing stated by [5]; the anarchic development of the commune creates low-class households within this commune.

In terms of type of latrine, we have inventoried 3 types including modern latrines, native latrines and those that directly discharge faeces into canals and rivers. The majority of latrines found in the households surveyed are native, 46% compared to 28% of native latrines and 26% of those directly pouring faeces into canals and rivers. The results obtained by [5] meet ours, he found a similar ranking according to the levels of standing per commune but also of the social category living in the commune. By field observations, households that dump their excreta into rivers and canals through the pipes are those near the river or canal regardless of the type of buildings or latrines because under these conditions even the supposedly modern latrines do not have septic tanks, they pour their excrement directly into the canals and rivers through the pipes.

In her thesis, [5] deplores the virtual absence of collective sanitation systems at the expense of self-contained sanitation initiatives whose plant failures and weaknesses in a national environmental policy lead to chaotic management of both solid and

liquid waste. It highlights the brewing effluents, all the domestic and industrial discharges that are discharged into the lake, through the rivers that cross the city.

The absence of public landfills throughout the city confirmed by 82% of respondents pushes the population to throw waste in pirate landfills and this is confirmed by 51.3% of respondents (rejection in gutters, streams, public places, etc.). The works of [16] have shown that waste dumped in mainly solid rivers ends up clogging them, often causing flooding and causing desolation of all kinds within communities.

Human health depends primarily on society's ability to manage the interaction between human activities and their biological environment in a way that safeguards and promotes health without compromising its natural environment. This interpretation emphasizes the fact that environmental, economic and social conditions in some urban areas can affect human relationships, induce stress and have positive or negative consequences on the health status of social groups, households and individuals living there [17].

In view of the above, the health situation in the city of Bukavu is conditioned by the environment in which this population lives on a daily basis. Thus, the results of our research on the health situation show that malaria occupies the first position followed by typhoid fever and cholera. All these diseases are caused by poor hygienic conditions. With regard to the statistical analysis that we carried out to look for dependence between certain variables, it is clear that there is no dependency relationship between belonging to a commune and other variables tested because the p values for all these variables are well above 0.05. Nevertheless, it is important to note that the methodological approach chosen to carry out this study has a number of limitations, including (i) the sample size that does not correspond to the requirements of a sociological study that would require a sample of up to 10-25% of the population, this, of course, is a matter of financial, logistical and temporal constraints, (ii) the reluctance to answer a few personal questions (out of misunderstanding or fear of reprisals from the administrative authorities), (iii) the difficulties of conducting the household survey and interviews with targeted services due to Covid-19 because this fieldwork coincided with the beginning of containment in our study area.

V. CONCLUSION

This study highlights the anarchic urbanization of the city of Bukavu, which is observed acutely over time. The cause of anarchic urbanization is the population growth that is a corollary to the rural exodus, based on statistics on the population changes in the city of Bukavu, which increased from 168836 in 1986, 241426 inhabitants in 1996, 584600 inhabitants in 2006 (INS, 2009), 976372 inhabitants in 2016 to reach 1037645 inhabitants in 2018 (INS, 2019). This rural exodus is justified by insecurity in the territories of South Kivu province, which has led to a massive displacement of the population from rural areas to the city. This influx of people into a city designed for 50,000 habitats is not without socio-economic consequences. The majority of the population is faced with a precarious socio-economic situation. Our results revealed that access to basic services is a challenge such as electricity, clean water, sanitation, decent housing, etc. For example, more than half of the households surveyed do not have easy access to safe drinking water, and more than 80% of the households surveyed do not have access to adequate sanitation services. This exposes the population to a risk of water-related diseases, as indicated by the annual reports of the Provincial Health Inspectorate of South Kivu (IPS/South Kivu) and the Provincial General Hospital of Reference in Bukavu in 2013. These reports show the extent of water-related diseases on morbidity and mortality in the city of Bukavu. The reference [18] have shown that each of the elements related to water, sanitation and health mobilizes economic, social and environmental factors that are likely to modulate each other and influence aspects of other elements. The above is urgently needed by the authorities in charge of the management of the city of Bukavu to make arrangements for a development of the city that takes into account the socio-economic aspects for a sustainable city, whether for the city of Bukavu or for the likely extensions of the city for its de-cluttering.

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REFERENCES

- [1] PNUD (2006). Au-delà de la pénurie: pouvoir, pauvreté et crise mondiale de l'eau: rapport mondial sur le développement humain 2006. New-York (EtatsUnis)/Economica, Paris (France). 422 p.
- [2] Osmont A. et al., (1992). La gestion sociale urbaine dans les pays en développement.

- [3] Dauvergne S., (2011). Les espaces urbains et périurbains à usage agricole dans les villes d'Afrique subsaharienne (Yaoundé et Accra). Une approche de l'intermédialité en Géographie. Thèse de doctorat : Ecole Normale Supérieure de Lyon (France), 21p.
- [4] OMS/UNIC (2010). Joint Monitoring, Programme. Progress on Sanitation and Drinking Water 2010 Update. Available at <http://whqlibdoc.who.int/publications/2010/97892>
- [5] Lina Alex, (2016). Evaluation des charges polluantes (domestiques et industrielles) arrivant au lac Kivu dans la ville de Bukavu, RD. Congo. Thèse de Doctorat, Université de Liège, Faculté des sciences, Unité Assainissement et Environnement, page 33-41.
- [6] Ilunga L. (1989). Problèmes géologiques d'aménagement dans la zone de Kadutu (ville de Bukavu, Zaïre). Cahiers du CERUKI, nouvelle série, n° 24, pp 40-51..
- [7] Chamaa M.S. ; Bidou J.E. ; Boureau P.Y. ; Lambert A. ; Ndagiriyehe A. ; Gakinahe G. ; Muzalia W. & Sebakunzi N., (1981). Atlas de la ville de Bukavu. *Cahier de CERUKI, Bukavu*, 59p
- [8] Kalikone C. et al., (2017). Impact des déformations du sol sur la vulnérabilité des réseaux de distribution d'eau et d'électricité à Bukavu (RD Congo). *Geo-Eco-Trop.*, 2017, 41, 2, n.s.: 279-292. Numéro spécial.
- [9] Cosgrove, W.J. & F.R. Rijsberman (2000) World Water Vision: Making Water Everybody's Business. London: Earthscan Publications.
- [10] PNHAB, (2013). Le projet de la mise en œuvre de la politique nationale de l'assainissement en RDC.
- [11] Hervé Gondie, (2015). Étalement urbain et disparité spatiale des modes d'accès à l'énergie électrique dans la ville de Ngaoundéré (Nord-Cameroun), *International Journal of Humanities and Cultural Studies* ISSN 2356-5926
- [12] Blaise H. Nguendo Yongsy et Christopher R. Bryant, 2008. Visages et défis des principales villes camerounaises, Laboratoire Développement durable et dynamique territoriale. Département de Géographie, Université de Montréal C.P. 6128, Succursale Centre-ville Montréal (Québec) Canada H3C 3J7 Department of Geography & Environmental, ISBN 978-2-921903-01-1
- [13] Birembano R., (2015). La ville de Bukavu, les espaces et les hommes, séminaire tenu au Centre Amani à Bukavu en 2015.
- [14] UNEP (2013). Problématique de l'eau en République Démocratique du Congo: Défis et opportunités. Rapport technique. Nairobi, Kenya, 94 p.
- [15] Lelo N.F. (2008). Ville et environnement. Espace Harmattan Kinshasa, 282p.
- [16] Moeyersons J., Trefois Ph., Lavreau J., Alimasi D., Badriyo D., Mitima B., Mundala M., Munganga D.O. & Nahimana L. (2004). A geomorphological assessment of landslide origin at Bukavu, Democratic Republic of Congo. *Engineering Geology*, 72/1: 73-87.
- [17] Lawrence Roderick, (1999). «Urban health: An ecological perspective». *Reviews on Environmental Health* : 1-10.
- [18] Forget G. et Lebel J., (2001). Une approche d'écosystème à la santé humaine. In *Journal International de la Santé Professionnelle Et Environnementale*; supplément au volume 7, n° 2, pp. 537-538.