Risk Perception And Urban Disaster Management In The City Of Bukavu, D.R.Congo

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Corresponding author: Gervais Rugenge Baguma. E- mail: gbrugenge@yahoo.fr. ORCIDID: http://orcid.org/0000-0002-9990-0353
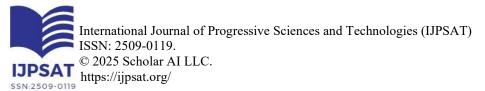
Abstract. The rapid expansion of cities in the Democratic Republic of the Congo is accompanied by a range of problems and an increase in natural or anthropogenic disasters. For more than a decade, the city of Bukavu has been experiencing a growing upsurge in natural disasters, including flood and landslides in rainy season, while dry season is marked with episodes of houses fires ravaging entire neighbourhoods with loss of human lives and significant material damages. Beyond the known causes, in July 2023 we have interviewed 454 participants to examine the community experience of disaster and its risk`s perception to gauge their preparedness. Findings show that 83.5% have already witnessed a disaster. About the causes, natural and anthropogenic are generally known by the entire population, including 13,3% of respondents evoking the climate change. However, 60% of the participants attribute disasters to supernatural causes, including evil spirits and the end of the time; this varies significantly with the level of education (p<0.05). Although, 58,7% perceive the risk of disaster, 49% think of prayer among of the prevention strategies while 40,3% said it's a state duty. Local authorities admitted their weakness in disaster prevention due to laxity in enforcing urban regulations, funds limitation and absence of contingency plan. To remedy this situation, it is important to the authorities to raise awareness, while fighting against corruption would make possible to clean up the urban planning and housing sectors, as well as the application of land laws. Measures to retrace avenues should be restarted.

Keywords –: Disaster, Risk, perception, Prevention, Bukavu - Congo D.R.

1. INTRODUCTION

Cities in the Democratic Republic of Congo are anarchically and rapidly expanding following a galloping demography and rural exodus driven by a range of factors, including the hope of employment, a better life in the city and the almost permanent insecurity in rural areas in the eastern part of the country.

A disaster is a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts (UNDRR, 2017) [1].

WHO defines the risk as "the combination of the probability of an event and its negative consequences. More specifically, emergency or *disaster risk* is defined as "The potential of loss of life, injury or destruction of assets which could occur to a system, society or a community in a specific period, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" [2]. About risk occurring in developing countries, populations and territories are subject to multiple risks and vulnerabilities. According to Fernandez, actors within such contexts manage risk at different scales and levels: authorities, technicians, administrators, territory planners, merchants, local communities, indigenous and non-indigenous groups [3]. For Lechowska, *risk perception* can be defined as "an assessment of the probability of hazard and the probability of the results (more often—the negative consequences) perceived by the society [4].

In addition, some authors consider that risks perceived by society can differ from those identified by risk specialists due to:

  i)   the type of knowledge (e.g., technical or vernacular) [5], [6], [7],
  ii)   institutional affiliation [8], [9],
  iii)   being insiders or outsiders to disasters [10],

Attitude is a settled way of thinking or feeling about something. According to R. Holzman et al, the reactions of populations to natural disasters are sometimes considered irrational [11]. *Risk attitudes* are people's intentions to evaluate a risk situation favourably or unfavourably and to act accordingly. The underlying traits are risk propensity and risk aversion, i.e. cautiousness. High risk propensity can induce hazards; on the other hand, risk management activities may require some risk propensity; and *risk communication* is a social process by which people become informed about hazards, are influenced towards behavioural change and can participate in decision-making about risk issues in an informed manner. Such activities are part of almost all emergency management efforts. For effective risk communication, a sound understanding of risk perceptions and attitudes is indispensable, while *Risk management* are manifold procedures for reducing risks (either the hazard itself or its consequences) to a level deemed tolerable by society; this includes monitoring, control and public communication [12].

For more than a decade, the city of Bukavu has been experiencing a growing upsurge in natural disasters, linked to its mountainous landscape and anthropogenic activities. Indeed, in the rainy season, the phenomenon known as "*mugezi*", a local name for rainwater runoff, carries away people, houses, and cars, causing loss of human lives and significant material damage. This is usually followed by floods in the shallows of the hills, which were once uninhabited and now overflow with thousands of dwellings.

Previous studies have identified the causes of these disasters [13], and preventive measures have been proposed [14], but the phenomenon keeps getting worse. Understanding how people perceive risks is one important factor contributing to successful risk communication, and risk perception is an important determinant of attitudes of people toward a given hazard [15, [16], [17].

Regarding the above situation, in July 2023, we have conducted this study to examine the communities' experience of disaster and their perception of disaster risks to gauge their preparedness, aiming to answer three research questions below:

  (1) How do the communities perceive their experienced frequent disasters?
  (2) How do the communities perceive the risks related to those disasters?
  (3) What are the preventive measures set up by the urban authority?

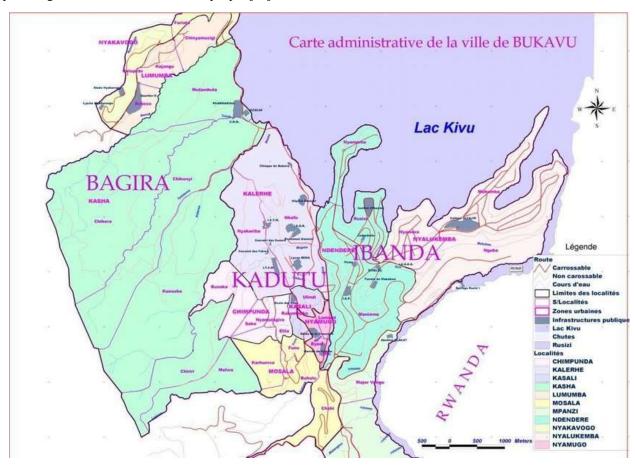## 2. METHODOLOGICAL APPROACH (METHODS)

[1]. Type and period of study

Our study is of a descriptive and cross-sectional type which focuses on the perception of disaster in Bukavu city. It took place from the1srt to the 30th of July 14, 2023.

2.2. Study framework

From the 2019 mayor report, Bukavu is the capital of South Kivu province in eastern DRC. It is located to the south of Lake Kivu, 90 km from Goma, and bordered by Rwanda via the Ruzizi River and Lake Kivu. It is administratively subdivided into three communes (Bagira, Ibanda and Kadutu) with 20 districts and 5,000 avenues. The covers an area of 60 km^2 with a population of 1,625,785 inhabitants

▪ 412,065 women

▪ 268,868 men,

▪ 425,566 boys,

▪ 519,286 girls

❖People living with disabilities 2%: 32,515 people [18].

Fg1, Administrative Map of Bukavu city

Source: https://www.researchgate.net/profile/Arsene-Balasha-Mushagalusa/publication/344227468/figure/fig1/

AS:935292345262082@1600002480857/Carte-administrative-de-la-ville-de-Bukavu-Les-echanges-transfrontaliers-entre-la-RD.jpg

2.2. involvement of the urban authority

Given the relevance of the topic, the mayor of Bukavu was briefed on the objectives and purpose of the study and granted approval for collaboration with urban departments.

2.3. Sample selection and data collection

We employed a two-stage cluster probability sampling approach. First, the three communes of Bukavu were divided into representative neighbourhoods (first stage). Then, in each neighbourhood, households were randomly selected and surveyed until the target number of respondents was met (second stage). The sample size was defined using the Cochran sampling formula as follow;

1. e: desired level of precision, the margin of error
2. p: the fraction of the population (as percentage) that displays the attribute
3. z: the z-value, extracted from a z-table 6262 The entry for z in a z-table represents the area under the normal distribution curve to the left of z

More than 50% of the neighbourhoods of the city of Bukavu are exposed to the risks of natural disasters. Thus, the size of our sample, starting from the total population, represents about 50% of the population of the city of Bukavu. The use

1- of the standard values indicated above gives the following calculation:

Size of targeted population=1 337 000 inhabitants *50/100=668 500

Cochran's sample size formula

$$n_o = \frac{z^2 \cdot p \cdot (1 - p)}{e^2}$$

p: the population size
e: the margin of error
z: the z-value, extracted from a z-table

= (1.96) * 0.5*(1-0.5) / (0.05)2 =0.9604/0.0025=384.16

We added 5% to the sample to account for imponderables such as non-response or recording errors. N + 5% = 384 + 19 = 403 people

Then we applied the law of the proportion of the population of each municipality:
Bagira: population/population of the city → 26.0% * 403 = 105
Ibanda: population/population of the city → 35.5% * 403 = 143
Kadutu: population/population of the city → 38.5% * 403 = 155
The choice of neighborhoods and avenues was made according to the random number.
For each avenue chosen, we used a survey of the population of the municipalities divided by the number of avenues.

In addition, we have included 21 urban administrative staff members distributed as follows:

- The mayor's office: 6
- Municipality of Bagira: 3
- Municipality of Kadutu: 3
- Municipality of Ibanda: 3

b) data analysis.

To better analyse the data collected from our respondents, we used qualitative and quantitative analysis. For a reliable verification of our hypotheses, the coding, analysis and processing of the data were carried out using the SPSS and the Chi2 statistical test,

2.5.3. Analytical methods

It will allow us to analyse the results. Indeed, this method is useful in the interpretation of the results obtained during our investigation.

2.5.4. Questionnaire technique

It allowed us to collect information on the experience and perception of population and local authorities on disaster risk and their responsibilities on its prevention.

2.5.7. Ethical consideration

Local, health, customary and administrative authorities were informed of the study. Individual informed consent was obtained from each participant. Participation in the study was free and voluntary. Confidentiality was respected.

2.5.8. Data entry and analysis

The data were collected on a pre-established survey form. Data entry and analysis were carried out using Access and SPSS software.

3. FINDINGS
3.1. Characteristics of the sample

Tableau 1: Sample distribution by age and gender

Age and sex distribution of the sample

age range	Male	%	Female	%	Total.
18 - 27 years	47	*22.2*	61	*28.6*	108
28 - 37 years	69	*32.7*	59	*27.6*	128
38 -47 years	35	*16.6*	35	*16.4*	70
48 -57 years	33	*15.6*	27	*12.6*	57
58 -67 years	22	*10.4*	23	*11*	45
67 and beyond	5	*2.5*	8	*3.8*	13
Total	**211**	**100**	**213**	**100**	**424**

Comment:

This table indicates that the largest proportion of male respondents falls within the 28–37 age group, representing 32.7% of the male sample. Among female respondents, the majority are aged between 18 and 27 years, accounting for 28.6%. This is followed by 22.2% of men in the 18–27 age group and 27.6% of women in the 28–37 age group.

Table 2. Sample distribution by education level

education level	male	%	female	%	Total
None	31	*14.7*	62	*29.1*	93
completed primary school	37	*17.5*	69	*32.4*	106
completed high school	86	*40.8*	55	*25.8*	141
College/University	57	*27*	27	*12.7*	84
Total	**211**	**100**	**213**	**100**	**424**

P<0.05

Comment:

This table reveals a gender disparity in educational attainment, with more men in school than women. 27% of male respondents have attained higher education, compared to only 12.7% of female respondents. Additionally, 40.8% of men have a secondary-level education, while the figure stands at 25.8% for women. Illiteracy is more prevalent among women (29.1%) than men (14.7%), highlighting a significant gap in educational access or retention between genders.

Table 3: Sample distribution by occupation

Occupation	Male	%	Female	%	Total
miscellaneous technics	48	*22.7*	11	*5.2*	59
small informal trader	54	*25.6*	94	*44*	148
civil servant	37	*17.5*	25	*12*	62
business/trader(formal)	23	*10.9*	19	*8.9*	42
Politician	17	*8.06*	8	*3.8*	25
Student	27	*12.8*	23	*11*	50
Others	5	*2.37*	33	*15*	38
Total	**211**	**100**	**213**	**100**	**424**

Comment:

This table shows that the majority of respondents engage in informal trade, 44% of women compared to 25.6% of men. Then come civil servants with 12% women against 17.5% men. Political roles are predominantly held by men, with 8% participation compared to just 3.8% among women.

3.1. How do people perceive their experienced frequent disaster?

Tableau 4: Distribution of the sample according to disaster experience

municipality	Neighbourhood	Yes	%	No	Total
BAGIRA	Nyakavogo	11	*100*	0	11
	Lumumba	13	*76.5*	2	17
	Cikonyi	23	*82.1*	5	28
	Ciriri	24	*89.0*	0	27
	Chahi	9	*36.0*	13	25
	Sub total	*80*	*74.0*	*20*	*108*
KADUTU	Cimpunda	49	*94.2*	3	52

	Nyakaliba	27	*100*	0	27
	Nyamugo	26	*96.2*	1	27
	Nkafu	56	*89.0*	7	63
	Sub total	**158**	**93.5**	**11**	**169**
IBANDA	Ndendere	17	*56.6*	13	30
	Kamagema	27	*93.1*	2	29
	Irambo	26	*86.6*	4	30
	Mulungulungu	22	*73.3*	8	30
	Nguba	24	*85.7*	4	28
	Sub total	**116**	**79.0**	**31**	**147**
TOTAL		**354**	**83.5**	**70**	**424**

Comment:

This table reveals that overall, 83.5% of respondents have already witnessed a disaster in the city. The highest proportion is observed in the commune of Kadutu (93.5%), followed by Ibanda (79%) and Bagira (74%). At the neighborhood level, the Chahi district reports the lowest rate of disaster experience, with fewer than 50% of respondents indicating prior exposure.

Table 5: Distribution of respondents according to the type of disaster already experienced.

Type	Numbers	%
Fires	222	*62.7*
Floods	56	*15.8*
Landslides	76	*21.5*
Total	**354**	***100***

Comment.

This table shows that house fires account for 62.7% of the most well-known disasters, compared to 21.5% of landslides and 15.8% of floods.

Table 6: Sample distribution according to the consequences of experienced disaster

Consequences	Numbers	%
Death & injuries	114	32.2
House's damage	267	75.4
Goods 'destruction	56	15.8
Disruption of communication routes	17	5.0

From this table, we see that the destruction of houses is mentioned by 75.4% of respondents, deaths and injuries in 32.2%, the destruction of property by 15.8% and the destruction of communication routes occurred in 5% of cases.

The causes of disasters, according to the city's residents

Table 7: Causes mentioned for the various disasters

	BAGIRA		IBANDA		KADUTU		TOTAL	
Causes houses` fires	**n=97%**		*n=113%*		*n=144%*		**n=354%**	
Negligence / recklessness of people	**28**	*29*	**44**	*39*	41	**28.5**	113	*31.9*
Poor power connexion	**33**	*34*	**37**	*33*	43	**30**	113	*31.9*
Anarchic construction	**26**	*27*	**39**	*35*	37	**25.7**	102	*28.8*
Too tight wooden houses	**31**	*32*	**42**	*37*	57	**39.6**	130	*36.7*
Evil spirits (*mapepo*)	**55**	*57*	**67**	*59*	83	**57.6**	205	*57.9*
End time	**59**	*61*	**66**	*58*	88	**61.1**	213	*60.2*
Causes of landslides and flood								
Anarchic constructions	**33**	*34*	**41**	*36*	38	**26.6**	112	*31.6*
Construction on slippery slopes or in marshes.	**46**	*47.4*	**33**	*29*	35	**24.3**	114	*32.2*
Absence of water pipes	**14**	*14.4*	**17**	*15*	27	**19**	58	*16.4*
Clogging of gutters with garbages.	**10**	*10.3*	**11**	*9.7*	22	**15.4**	43	*12.1*
Climate change	**15**	*15.5*	**16**	*14*	16	**11.2**	47	*13.3*
Absence of avenues	**25**	*23*	**25**	*22*	27	**19**	77	*21.7*
Evil spirits (*mapepo*)	**52**	*53.6*	**57**	*50*	83	**57.6**	192	*54.2*
End time	**58**	*60*	**69**	*61*	82	**57**	209	*59*

Comment:

This table shows the causes mentioned by the participants according to the type of disaster. Concerning house fires, supernatural causes come in first place with 60.2% from evil spirits and 57.9% from the end of time. Then come the "too tight wooden constructions" with 36.7%, followed by the negligence of the inhabitants and the poor electrical installations with 31.9% each, and finally the anarchic constructions with 28.8%.

Regarding landslides and floods, supernatural causes are mentioned more, with 59 and 54.2% respectively for the end time and evil spirits. Then come constructions on slopes or in valleys with 32.2% and anarchic constructions with 31.6%, followed by the absence of avenues with 21.7%. The absence of water pipes, climate change and the clogging of gutters by garbage are mentioned by less than 20%, respectively.

Table 8: *Evocation of supernatural causes according to level of education*

	Instruction level									
Supranatural causes	None	*%*	primary	%	secondary	*%*	high	%	**Total**	significance
Evil	35	*39.8*	33	37.5	18	*20.5*	2	2.3	**88**	p>0.05
End time	47	*40.2*	43	36.8	19	*16.2*	8	6.8	**117**	p>0.05
Total	82	*40*	76	37.1	37	*18*	10	4.9	**205**	p>0.05

Comment:

These results show that the attribution of disasters to Evil Spirits increases with the level of education. It is 39.8% among illiterate people and 37.5% among those at the primary level, 20.5% among those at the secondary level and 2.3% among those at the higher and university levels, respectively. The same trend can be observed for those who think about the time of the end.

1.2. Residents' perception of disaster risk

Table 9:Sample distribution accordant to the perception of disaster`s risk

municipality	District	M	%	F	%	Tot	%
BAGIRA	Nyakavogo	8	67	4	33	12	85.7
	Lumumba	6	50	6	50	12	50
	Cikonyi	8	67	4	33	12	42.8
	Ciriri	7	64	4	36	11	42.3
	Chahi	13	72	5	28	18	81.8
	subtotal	*42*	*65*	*23*	*35*	*65*	*57.4*
IBANDA	Ndendere	4	50	4	50	8	26.6
	Kamagema	9	75	3	25	12	42.8
	Irambo	9	69	4	31	13	43.3
	Mulungulungu	11	61	7	39	18	58
	Nguba	6	55	5	45	11	39.3
	sous total	*39*	*63*	*23*	*27*	*62*	*42*
KADUTU	Cimpunda	23	64	13	26	36	68
	Nyakaliba	13	59	9	41	22	81.5
	Nyamugo	13	59	9	39	22	81.5
	Nkafu	30	70	12	30	42	68
	subtotal	*79*	*65*	*43*	*35*	*122*	*72*
	TOTAL	**160**	**64**	**89**	**36**	**249**	**58.7**

p<0.05

Comment:

This table shows that overall, 58.7% of respondents perceive the risk of disaster in their environment, with the highest rates in the commune of Kadutu (74%), followed by the commune of Bagira (57,4%) and Ibanda (42%). Considering the neighbourhoods, the perception of risk is higher (>70%) in the neighbourhoods of Nyakavogo and Chahi (Bagira commune), Nyakaliba, Nyamugo and Nkafu (Kadutu commune). Coming next are the districts of Cimpunda (Kadutu), Mulungulungu (Ibanda) and Lumumba (Bagira) (50-69%). The risk is more perceived by men than women.

3.2. Prevention measures according to inhabitants

According to the table below, almost half of the respondents (49.3%) believe that prayer can prevent disasters. 40.3% think that it is a role of the state. Disaster prevention measures are generally mentioned by less than 40% of the inhabitants, with a significant difference between men and women.

Table 10: Public knowledge of disaster prevention measures

	N= 211		213		=24	
Means of prevention	**Male**	**%**	**Female**	**%**	**Total**	**%**
Avoid anarchic constructions	92	43.6	50	23.5	142	33.5
do not build on dangerous land	78	36.97	51	23.9	129	30.4
do not obstruct water drainage channels	61	28.91	21	9.86	82	19.3
avoiding fraudulent electrical connections	62	29.38	54	25.4	116	27.4
avoid storing gasoline in homes	68	32.23	52	24.4	120	28.3
Extinguish braziers and stoves before sleeping	39	18.48	48	22.5	87	20.5
regular cleaning of gutters	43	20.38	31	14.6	74	17.5
state involvement at all levels	94	44.55	77	36.2	171	40.3
educating the population	43	20.38	28	13.1	71	16.7
sanction the land registry/land affairs authorities	46	21.8	22	10.3	68	16
Pray God	71	33.65	138	64.8	209	49.3

Prevention measures and disaster management by urban authorities

Check the list of preventive and management measures for the disasters.

Mayor disaster prevention	Yes	No	Comments
Existence of land use planning		X	urban spaces are already saturated plus an anarchic emergence of new neighborhoods
Prevention/avoiding habitation in risk zones		X	Most of the risk areas are enclosed by wooden constructions.
Disaster resistance buildings		X	Building standards exist but are not respected
Community awareness	X		we publish programs on the national radio and community radios do the same.
Existing of contingence planning		X	Plan not updated due to lack of resources
Land protection measures are reinforced		X	There is a relaxation of public services.

Disaster Management	Yes	No	Comments
Existence of contingency plan	X		not updated
Existence of firefighting vehicles	X		only two vehicles
Accessibility of homes to vehicles			several neighbourhoods are inaccessible due to the absence of avenues and streets
Firefighters available	X		a service exists but not supported by the state
Operational civil protection service	X		existing but poorly equipped

Comment.

This list shows a notorious failure in disaster prevention measures in the city marked by the non-existence of a master plan, construction on high-risk sites due to laxity in the application of legal measures. As for disaster management, it is very difficult due to the limited financial and material resources, in a context of inaccessibility to several districts of the city.

Qualitative findings.

Q1/ Why are there constructions in risk areas?

A/ There is a strong demand for land in a city with no space for expansion. There is a ban on building in unsuitable areas, but the measures are circumvented by certain state agents.

Q/2. Why are these measures not observed?
A/ On the one hand, there is the indiscipline of the population and the weakness of public services. We witness construction on gutters, even above the REGIDESO pipes, and the clogging of the gutters with rubbish. In addition, we are faced with anarchic urbanisation, especially in the new peripheral districts of Kasha, Panzi, Bagira, Nguba and the villages of the Kabare chiefdom on the outskirts of the city. We are often confronted with the orders of the provincial government or the central government.

Q/3. What to do then?
A/. This is difficult in a context of impunity, corruption, and influence peddling. Unless coercive measures are decreed by the hierarchy. There should be a policy of extending the city into the territory of Kabare.

Q.4: What assistance do you provide to disaster victims in the city?

A/The municipalities and the town hall of the city are deprived of the financial means to cope with the increasingly growing demand to the point that our intervention appears insignificant in front of the population. That is why we resort to the provincial government,

which in most cases is in the same situation as we are. In addition, we only have two firefighting trucks that sometimes lack fuel. Also, the absence of avenues in many neighbourhoods makes it impossible to deploy a firefighting vehicle. The head of the Urban Planning and Housing Division says that Bukavu is saturated and has no empty space, which is why people are crammed into narrow spaces while the rural exodus continues.

About the emergency preparedness plan? (civil, provincial division of health)

Q6: Is there a contingency plan to intervene in the event of disasters?

A/ The last contingency plan of the province has been developed 9 years ago and never been updated. We interviewed urban and municipal authorities to find out how they perceive and address the problem. Urban and municipal agents recognize that fires are the main disaster in this city. As for the causes, it is a fraudulent connection of the electric current called "*dahulage"*, a word derived from the local Mashi dialect of the verb "*kudahula*" which means to catch fire in the neighbor's house. In addition, there are poor electrical installations and poor management of braziers or sometimes the conservation of gasoline in their plots despite the ban.

In addition, the city hall agents said that there have been measures to evict people from some unsuitable sites, such as Kabwa Kasirhe, Gihamba, but people come back to build houses on Sundays or at night.

In the event of a fire, we do not know how to intervene on the one hand because we do not have enough firefighting trucks and the two existing are either broken down or lacks fuel and, on the other hand, in almost all the neighbourhoods there are no avenues because they have never existed or have disappeared in favour of anarchic constructions.

Visits to high-risk neighbourhoods.

We interviewed residents of some of the landslide-prone neighbourhoods of Nyakavogo, Kabwa Kasirhe, Mulungulungu, and Irambo to ask about their risk assessments.

Q/*Why did you build on a site at risk?*

R/ This is the place that corresponds to our means, and the authorities have sold us land here.

Q/*Why do you stay in this neighbourhood despite the risk of landslides and flooding?*

R./ It is because we don't know where to go, and it is God who protects us."

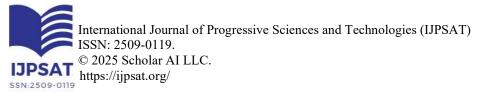Q/ *Can you move to another place if the authorities offer it?*

R/ Yes, but the state has no place to give us, nor to help us rebuild our houses.

IV. DISCUSSION

This study investigated the perception of disasters and the disaster prevention measures in Bukavu city, the Democratic Republic of Congo. Carried out on a sample of 454 people. It focused on people's experience of disasters and their perception of risk, as well as the preventive measures put in place by urban and municipal authorities in relation to it.

About knowledge and experience of disasters in the city.

Overall, our results show that a large majority of participants (83.5%) know and have already witnessed a disaster, with 93.5% in the commune of Kadutu, 79% in the commune of Ibanda and 74% in the commune of Bagira (Table 4). This is explained by the fact that repeated fires are more and more frequent in the 3 municipalities of the city, and there is their wide dissemination by the ten or so audio-visual media in place, associated with a significant public access to social networks. Also, about 85.5% of respondents have experience with disasters, with no significant difference between municipalities (p>0.05). This can be explained by poverty in almost all the city's neighbourhoods, where fires and landslides are most often mentioned. Indeed, several studies have shown that the poor are typically the most vulnerable in society because they are often the most exposed to the whole range of risks, and at the same time, they have the least access to appropriate risk management instruments (Holzman,2000).

As far as the causes of disasters are concerned, the natural and anthropogenic causes are generally known by the entire population, including 13,3% of respondents who consider the role of climate in disaster occurring (table 7). Ning Chen et al. emphasised that with the process of climate change and rapid urbanization, the climate risks faced by cities have increased unprecedentedly [19]. However, the latter are attributed to supernatural causes, in particular evil spirits and the time of the end (Tables 7), and this varies significantly with the level of education (p<0.05). Xiaohui Wang has showed a link between knowledge, attitude and disaster preparedness [20]. In addition, anarchic constructions are mentioned as predisposing factors to man-made disasters, in addition to fraudulent connections and poor electrical installations, locally called *"dahulage"*. These results are close to those of Banza et al. [14]. In Kenya, Koome et al. showed that these facts can be linked to fires in other informal settlements in cities like Nairobi, where fire outbreaks have been blamed on the use of kerosene stoves and illegal electrical connections [21].

On the perception of risk of disaster by the inhabitants.

Research has shown that when people feel the risk of an unacceptable event, they will engage in the behaviour that they believe is most appropriate and will give the best results to minimise risk [22]. Also, risk perception and intention of preparedness were predictors of disaster preparedness behaviour. For Sai Leung, risk perception significantly affected the intention of preparedness, and the effect was partially mediated by subjective norm [23].

Our results showed that the perception of risk differs between neighbourhoods. It is higher in the city's populous and poorer neighbourhoods such as Nyakavogo, Chahi, Nyamugo, Nyakaliba and Mulungulungu. Indeed, these places are among those that have experienced landslides and fires repeatedly in the last decade. Ali &Ismaila have found a significant positive relationship between place of residence and perception of disaster risks [24], while Z. Akbar et al. showed that the nature of the disaster and the context determines the perception of risk and a positive influence between disaster risk perception on disaster preparedness [25].

Despite this, these inhabitants do not leave the premises and remain exposed, arguing that they have nowhere to go. Wooden houses on steep slopes are erected even on old landslides or former fire sites. Amalia S. shows that this reluctance to abandon the scene of disaster is generally described as "irrational" or "illogical" by those involved in relief, yet attitudes to the upheavals of time and space are neither purely instinctive nor rigorously rational [26].
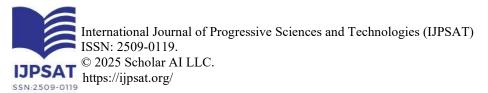
As a result, the various consequences related to natural disasters are not fortuitous. Thus, for example, Vinet et al. consider that disaster-related deaths are the expression of internal vulnerabilities (age, disability) or external vulnerabilities (unsuitable buildings) or of more or less conscious and more or less deliberate endangerment [27]. There is also a link between establish a link between vulnerability, personal decision-making, and poverty and authors believe that the poor tend to be at greater risk than the rich because they have limited access to the means and equipment that would enable them to manage risk [11].

Although we did not do an economic analysis in this study, it is obvious that the neighbourhoods with the highest risk of fires, landslides and floods are among the poor neighbourhoods of the city.

Concerning gender and perception of risk, several studies suggested that gender differences do exist, and as such, may affect human health risk during and immediately after flood events. Female survey respondents exhibited lower levels of awareness of the potential health risks posed by flooding, while they reported a higher likelihood of undertaking physically reduced actions within the home, such as boiling water or changing their drinking water source (e.g., switching to bottled water) [28,29,30].

In contrast, findings from Arturo et al. show that in addition to gender, education has a strong influence on the perception of risk, with educated women perceiving it more than men [31]. The role of education is crucial in risk perception as shown by several authors [20], [32]. In our wrong conceptions about disasters are high among less educated respondents (table 8).

The intersectional analysis showed that young and adult females perceived higher risks than their gender counterparts at the same age. Our results showed the opposite situation, where men and more educated people perceive the risk more than women and less educated people (p<0.05). Ming et al. showed that the type of disaster, the experience and gender are good predictors of risk perception as far as the impact is concerned, whereas education plays a role in perception of risk controllability, and that female respondent reported a lower level of awareness of the need for post-flood action(s) (8.9% vs. 16.5%). [33].

The role of belief is also important in this environment dominated by Christianity and traditional beliefs. Thus, we also see that nearly 50% of people believe in divine intervention in disaster prevention rather than rational measures (Table 10). This is related to the knowledge of the causes of disasters already attributed by part of the population to supernatural causes (Table 7). Previous studies emphasized on the role of religion and culture in risk perception [34], [35], [36].

According to social scientists specialising in the study of social perception, people's perception or understanding of natural disasters is socially constructed. This means that any understanding of how people perceive natural hazards should take into consideration the context within which natural hazards are experienced [37].

These faith-based conceptions are not only attributable to the Christianised environment. Nuray showed that among the most common reasons for not preparing, 41% of people in Turkey stated that "it is God's will, what I do won't matter" [38]. For Arezoo et al., poor education, religious misconceptions, and some other economic and social factors may strengthen fatalism, which will have a negative effect on disaster management [39]. Even though public awareness can help lessen the harmful effects of disasters, cultural misconceptions and incorrect beliefs and attitudes could cause inadequate public behaviour in disaster preparedness and response [40].

About the preventive measures and disaster management practices in the city.

Our results show that there is an admission of powerlessness on the part of the urban authorities in the regulation of construction in the city. Similarly, there is a notorious failure in disaster prevention measures in the city marked by the non-existence of a ground plan, construction on sites at risk due to laxity in the application of legal measures. However, the Law No. 6-2019 of March 5, 2019 on the Urban Planning and Construction Code in its article 2 stipulates that: «The following are prohibited, except for special prescriptions: constructions in areas exposed to possible natural risks such as flooding, erosion, landslides, subsidence, quicksand, or others» [41].

As far as disaster management is concerned, it is very difficult due to limited financial and material resources, in a context of inaccessibility of several districts of the city, most of which lack roadways suitable for vehicles and a lack of fire-fighting vehicles.
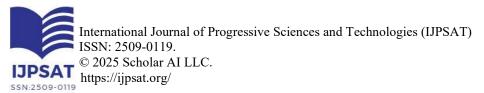
In addition, there no an updated contingency plan, due to limited resources and a political will to work on it. The urban and communal authorities, the land registry and urban planning and housing services, which grant land in places unsuitable for construction are worsening the situation. Michael K.& Elijah O. stated that while knowledge and awareness of response mechanisms were also good among slum inhabitants in Nairobi slum, there is, however, an evident gap in the enforcement of laws and regulations.[42]. For P. Wanja, around 29% of the urban fire management in Nairobi city was not effective [43].

Many of our respondents said that disaster prevention is a duty of the government (Table 10). This is almost similar to the results of D. Juma. & B. Munyao that established that the level of community understanding of their involvement in disaster risk management was low since 52% of the respondents believed that disaster risk reduction was the sole duty of the national government or county governments [44]. The arguments of local authorities could not prevail, as preparedness activities could have been undertaken to protect human lives and property in the face of threats that cannot be controlled through mitigation measures, or from which only partial protection may be achieved [45].

CONCLUSION CONCLUSIONS AND RECOMMENDATIONS.

The findings of this study illuminate the low level of disaster risk perception among Bukavu citizens and the laxity of government institutions in ensuring that laws and policies on urban areas are properly enforced, particularly those that safeguard the well-being of all citizens.

Informal and anarchical settlements did not simply pop out of nowhere, but are a result of poor planning, enforcement of policies due to rampant corruption.

Although most city residents have experienced disasters and have a moderate perception of disaster risk, a large portion of the population still attributes these events to irrational causes such as evil spirits or the end of times. These beliefs hinder awareness of individual and collective responsibility and contribute to people's reluctance to take action or abandon risky places and practices.

The laxity of the urban authorities, coupled with the lack of financial and material resources, leads to the weak prevention and poor management of disasters that have become recurrent, in particular landslides and deadly floods in the rainy season, as well as devastating fires in the dry season.

To remedy this situation, it is important that the civil protection service fully plays its role in raising awareness. The fight against corruption would make it possible to clean up the urban planning and housing sectors, as well as the strict application of land laws. Measures to retrace avenues, although unpopular, should be restarted.
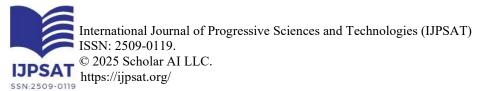
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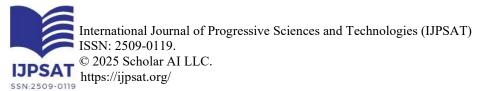
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