

**Assessment of the Awareness of Primary School Pupil's on the Impact of Flooding in
Ouagadougou**

Halidou KAFANDO *ID ([Orcid.org/0009-0000-0215-8053](https://orcid.org/0009-0000-0215-8053)), Vincent N. OJEH ([Orcid.org/0000-0003-2147-1824](https://orcid.org/0000-0003-2147-1824)), Blaise OUEDRAOGO, Prof. Ralf Löwner, Adama Boua DOUMBIA

Corresponding: kafandobangba8819@gmail.com/ +226 79393888

*WASCAL Graduate Research Programme on climate change and Education, University of The Gambia, Department of agriculture and environment science, P.O. Box 3530, Kanifing, The Gambia, Mobile: +226 79393888 Email : kafandobangba8819@gmail.com

**Department of Geography, Faculty of Social Sciences, Taraba State University, PMB 1176, Jalingo Taraba State, WASCAL Alumni, Nigeria.

Mobile: +234 8069427468 Email : vinceojehnetwork@gmail.com

***Research Associate in Geography - Institute of Environment and Agricultural Research - (INERA) lecturer at the Joseph Ki Zerbo University -Laboratory of Research and Studies on Environments and Territories (LERMIT), Burkina Faso

Mobile: 00226 70278332 Email: blaise32fr@iaahoo.fr

****Hochschule Neubrandenburg - University of Applied Sciences

Tel: + 49 (0)395 5693 4102, Fax: + 49 (0)395 5693 4999

Mail: loewner@hs-nb.de | Internet: www.hs-nb.de

*****WASCAL Graduate Research Programme on climate change and Education, University of The Gambia, Department of agriculture and environment science, P.O. Box 3530, Kanifing, The Gambia

Mobile: +223 78251767 Email: adabouadoumbia@gmail.com

1. Abstract

The study assessed the level of knowledge of primary school pupils in the Ouagadougou municipality about the impacts of flooding. In a context marked by an intensification of the impacts of the phenomena resulting from climate change and low levels of formal education, the aim of this article is to assess pupils' knowledge of flood impact prevention and risk management. Furthermore, it assessed pupils' understanding of the impacts of flooding, including the loss of life, animals and property, the risks to their safety, the disruption to daily life and the environmental impact. To achieve this, we developed a questionnaire adapted to the level of the pupils. The questions cover the definition, causes and impacts of flooding, as well as pupils' vulnerability to the effects of flooding, their level of training and awareness of disaster risk reduction. The questionnaire was developed on the KoboToolbox platform and deployed on smartphones using the KoboCollect application. A total of 387 pupils were surveyed, including 193 boys and 194 girls. The classes surveyed were year 4, year 5 and year 6.

Analysis of the pupils' results shows that they have a vague but very accurate knowledge of the definition, causes and impacts of flooding. For 95%, 76.44% and 98% respectively answered correctly to the definition, causes and impacts of flooding. These results bear witness to school

initiatives to raise awareness of disaster risks. However, this work shows that the authorities must not only raise awareness but also integrate disaster risk reduction into the curriculum in order to prepare future generations to mitigate the effects of disasters.

Key words: *Raising awareness, Impact of flooding, Pupils, Primary school, Ouagadougou (Burkina Faso)*

2. Introduction

Since the 1970s, natural disasters linked to extreme weather events have been increasingly observed in the West Africa Sahel and are being attributed to climate change (Mamadou Ibrahim, 2023). Flooding is one of the hazards that affect most cities in developing countries, where there are many shortcomings in urban development and planning (Chindji, 2023).

Many children are exposed to increasing levels of risk. Natural hazards, the effects of climate change, epidemics, economic downturns and rising food prices, increase vulnerability and reduce the resilience of children and their communities (UNICEF, 2022). The global action plan for disaster risk reduction is set out in the Hyōgo Framework for Action, adopted in 2005 (Nations Unies, 2005) by 168 states. Priority 3 of this five-point Framework is ‘to use knowledge, innovation and education to build a culture of safety and resilience at all levels¹»

In Ouagadougou (Burkina Faso), economic difficulties in accessing land are leading people to occupy spontaneous settlements that are comparable to shanty towns (also known as ‘non-parcelled-off’ areas), with no public facilities (Bronfort, 2017).

From the 2000s onwards, flooding has become a recurrent occurrence in the city of Ouagadougou. According to documentary research carried out in two print media, Ouagadougou experienced eight floods between 2002 and 2012. Rainfall amounts associated with the floods ranged from 43.8 mm to 261.3 mm. These floods caused loss of life, casualties, injuries, house collapses and other major damage to economic infrastructure cited by (Hangnon et al., 2015). The level of impact of climate change for a given region depends not only on the speed and magnitude of changes in climatic variables, but also on the region's exposure and vulnerability to these changes (Guilyardi et al., 2019).

The elementary school environment is one of the priorities for disaster risk reduction. It is highly vulnerable due to the structural conditions of the building, the knowledge of the community of teachers and students, and the capacity of the community of teachers and students (Usmaningtyas Ayu Dwi Septiningrum et al., 2022).

L'éducation est essentielle pour promouvoir l'action climatique. Il aide les gens à comprendre et à faire face aux effets de la crise climatique, en les dotant des connaissances, des compétences, des

¹Fédération internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge, 2018.

valeurs et des attitudes dont ils ont besoin pour devenir des agents du changement(UNESCO, 2022).

Reducing flood damage and ensuring the safety of people and property requires clear identification of the areas at risk of flooding and the factors that contribute to or amplify the extent of damage and loss caused by these disasters (Khalifa, 2015).

The work of(Justine, 2017) on the impact of flooding on the education system in Fokontany Ampefiloha and Ambodirano, reminded us that the Ministry of Education has a major responsibility to reinforce risk and disaster management courses in school curricula right from the basic level (primary cycle). In this way, schoolchildren can pass on the knowledge they have acquired to the surrounding region. In this way, everyone can master the risk of natural and non-natural disasters, and be able to apply the Disaster Risk Management Cycle. As a result, disaster risks can be reduced.

Floods have an impact on the education system and pupils. Morally, children are no longer motivated to study when classes resume after the floods. Children become lazy to go to school because teaching materials are almost destroyed. Some pupils don't come to school because they don't have enough to eat or because they are ill (diarrhea, cholera, etc.). This leads to an increase in absenteeism during the crisis period (Justine, 2017).

The 2009 floods damaged 351 schools out of a national total of 4,988, a rate of 7.03%. The floods caused a high dropout rate during the 2009-2010 school year due to the displacement of households, with some families returning to their villages. It also caused a delay in the implementation of school programs. Although the floods occurred during the school holidays, the occupation of classrooms by flood victims prevented the actual start of classes on Friday, October 2, 2009, in all schools across the country. This was due to disinfection and rehabilitation work in some schools (RGBF, 2010).

There are differences in the perception of flood risk between the districts in the study area: 82.5% of the population in the arrondissements of Pissy and Yabtenga (Ouagadougou district) consider floods to be dangerous or very dangerous, while 50% of the population in the arrondissement of Karpala Ouagadougou consider floods to be dangerous or very dangerous (Bronfort, 2017).

3. Methodology

3.1. Study Area

Our study area is the commune of Ouagadougou. The commune of Ouagadougou is located in the province of Kadiogo. It consists of twelve (12) arrondissements and fifty-five (55) sectors. It is the capital of Burkina Faso and the largest city in the country. It is bordered to the north by the rural communes of Pabr  and Loumbila, to the east by Saaba, to the south by Koubri and Komsilga, and to the west by the rural commune of Tanghin-Dassouri. The commune is located at 12°21'56" north latitude and 1°32'01" west longitude. Below the map of the study area.

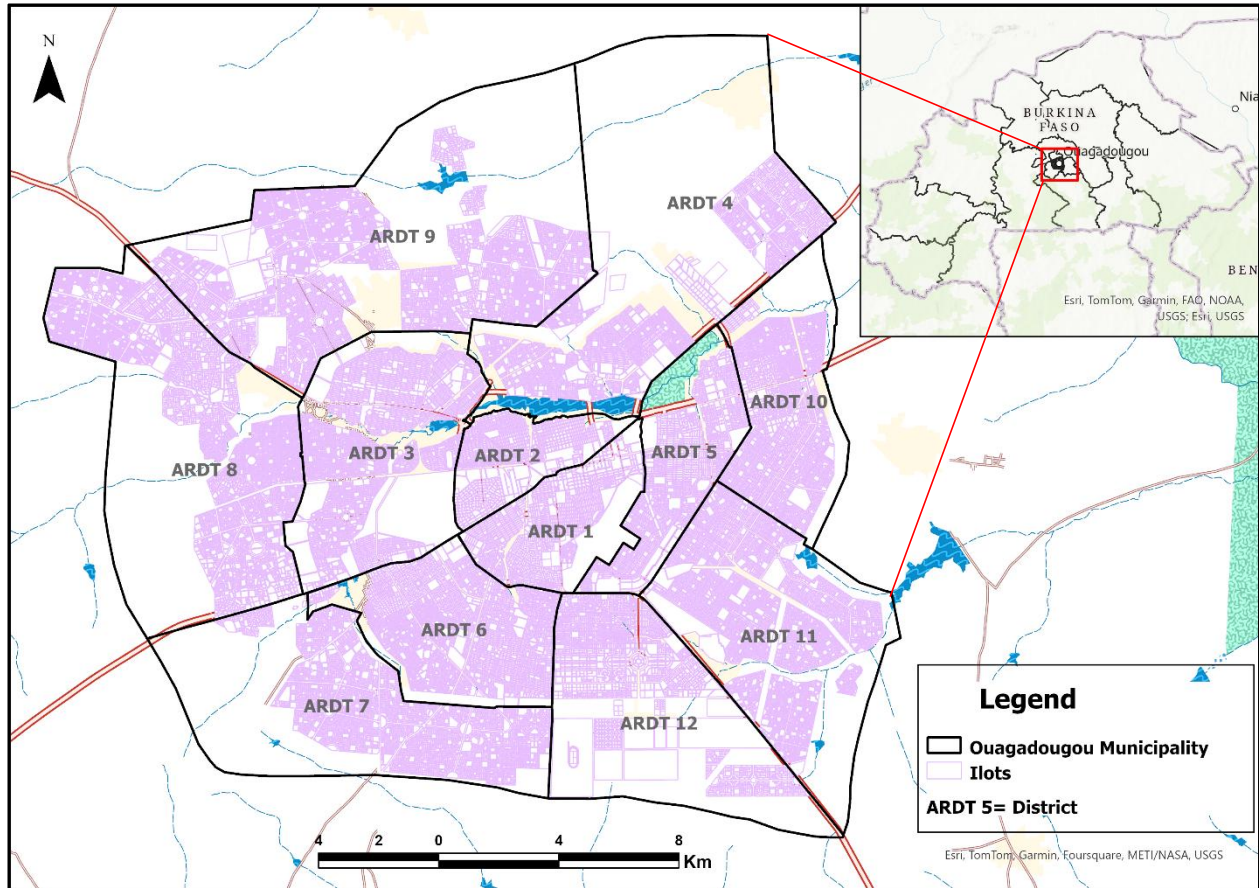


Figure 1: Map of the study area

3.2. Method used

In this study, a descriptive approach was adopted. The study was based on a questionnaire designed according to the significant information offered by the literature on the effects of flooding. The questionnaire was then field-tested with school principals and education inspectors. Finally, we collected their suggestions and modifications, which we incorporated in the final version of the questionnaire. We have summarised the various stages of the study's general methodology in a graph (Figure 2)

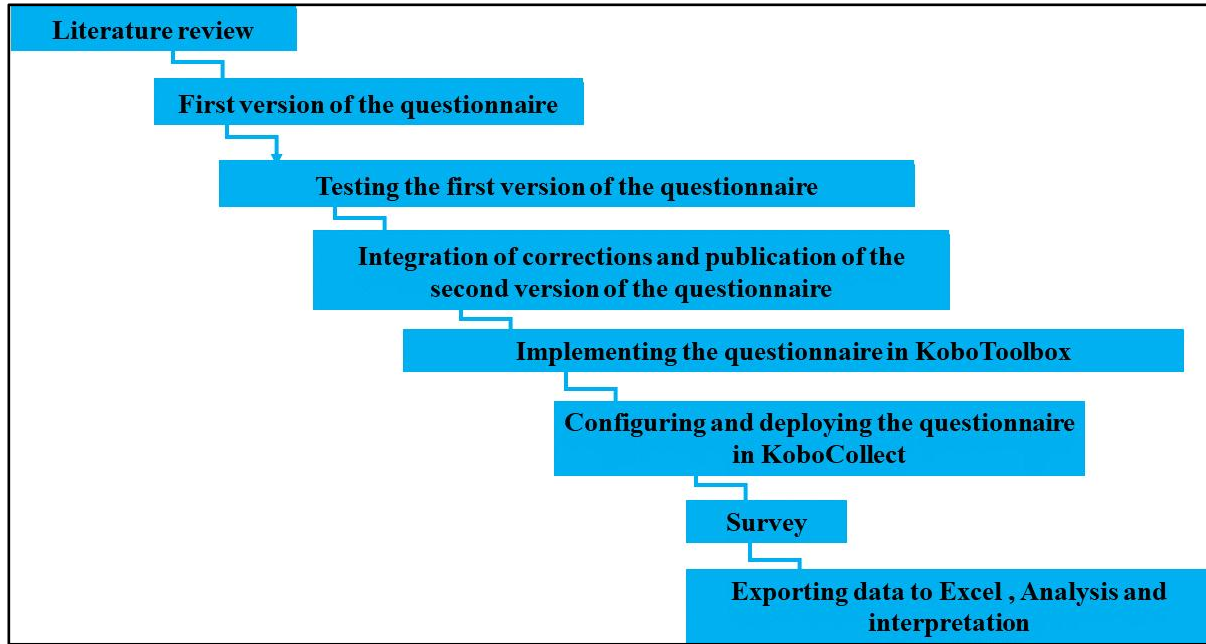


Figure 2:General methodology of the study

3.3. Data Collection Tools

The questionnaire, initially on paper, was digitized using the KoboToolbox platform through "Build from scratch" and tested online using the platform before being deployed in the KoboCollect mobile application for the actual interviews in the field.

3.4. Data processing tools

Our survey data is extracted from the KoboToolbox platform in Excel xlsx format. The data was cleaned, processed, and analyzed using Excel 2016. Once the data was processed, this software allowed us to create the graphs and tables for this paper. Word 2016 was used for text input. We used NVIVO software to produce the word cloud graphs.

3.5. Target Population

Our study area was chosen to be the urban commune of Ouagadougou because of its frequent flooding. We chose to carry out our surveys in all 12 Basic Education District (BED) in Ouagadougou, in both public and private primary schools. We made a conscious choice to survey pupils in Year 4 to Year 6 classes, as lessons begin in Year 3, and a pupil arriving in Year 4 or above will be very comfortable answering our questions. We surveyed 5 schools in each Basic Education District (BED) a total of 60 schools, with 6 pupils per school and 2 pupils per class. Our objective was to reach 360 pupils in the Ouagadougou commune, but in the end we succeeded in interviewing 387 pupils. Table 1 shows the different class levels interviewed and their gender.

Table 1:Class and gender surveyed

Classes surveyed	Number of respondents	Percentages
year 4	127	32,82%
year 5	125	32,30%

year 6	135	34,88%
Total	387	100
Gender	Workforce	Percentages
Male	193	49,87%
Female	194	50,12%
Total	387	100

3.6. Survey area

The different areas surveyed are the 12 Basic Education District (BED) covering the city of Ouagadougou. Within the commune, we have 1 Basic Education District (BED) in each arrondissement. In other words, in arrondissement 1 we have Basic Education District (BED) 1, and so on. In this sense, we conducted the surveys in the 12 arrondissements of the Ouagadougou commune. The map in figure 3 shows the different schools the interviewers attended.

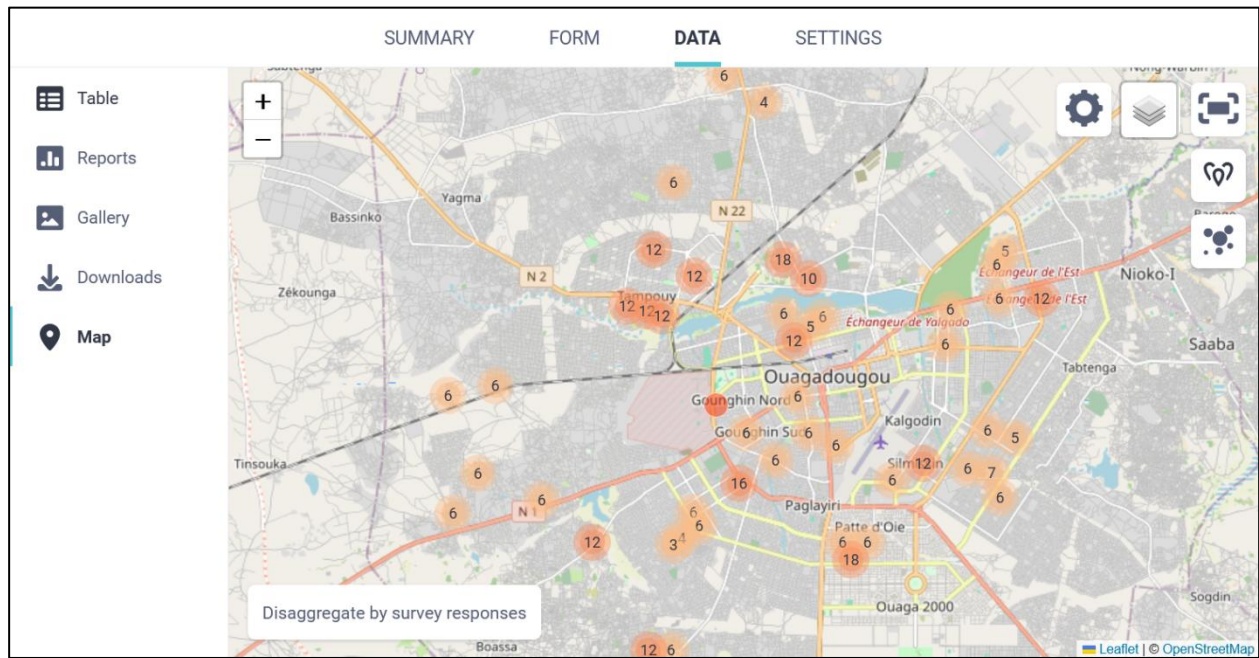


Figure 3:Map of surveyed sites

3.7. Surveys

The questionnaire consisted of closed questions, i.e. we asked questions and suggested answers for the students to choose from, semi-closed questions, i.e. if the student had an answer other than the suggested one, they suggested their answer, and open questions, i.e. the question was asked and it was up to the student to find the answer.

4. Result

4.1. Student knowledge of flooding

4.1.1. Definition of flooding

When asked the question "What is a flood?", 94.5% of students had a correct answer to the definition of a flood, 3.4% couldn't find the definition and 2.2% had no answer. We considered definitions such as "It's when it rains and there's a lot of water in the houses, schools, it's when the waters of heavy rain devastate a locality, water flows and makes houses fall, flooding is when it rains a lot and the water makes houses, trees, cars and motorcycles fall" to be the correct answer. We considered "it's the rainy season, abnormal presence of a large quantity of water in a jar due to an incident, it's a natural disaster etc." to be the wrong definition. Figure 4 is a proportional chart of respondents.

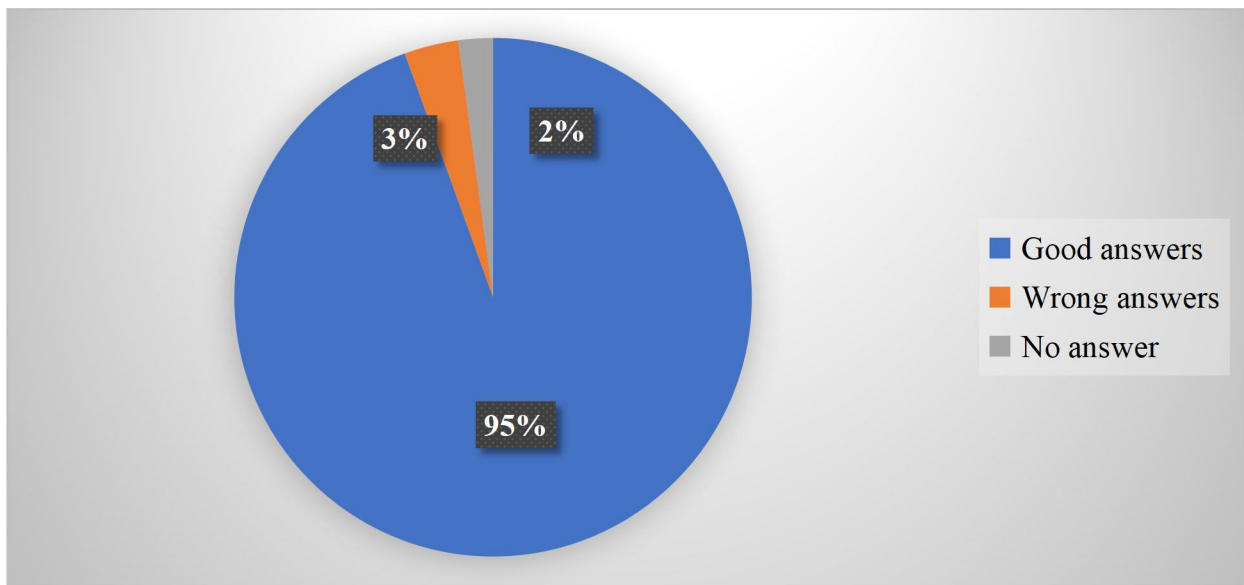


Figure 4:Definition of flooding

4.1.2. Causes of flooding

The second question in our questionnaire was about the causes of flooding. For this question, 76.4% of students gave the correct answer to the causes of flooding, compared with 21.15% and 2.40% who gave no answer. Some of the students' correct answers were "heavy rain, lack of gutters, silting of gutters preventing rainwater drainage, blocked gutters and lack of gutters, heavy rain and blocked gutters. The wrong answers include "death, over-cutting of wood, when a pipe breaks, houses fall down, poor house construction (Figure 4).

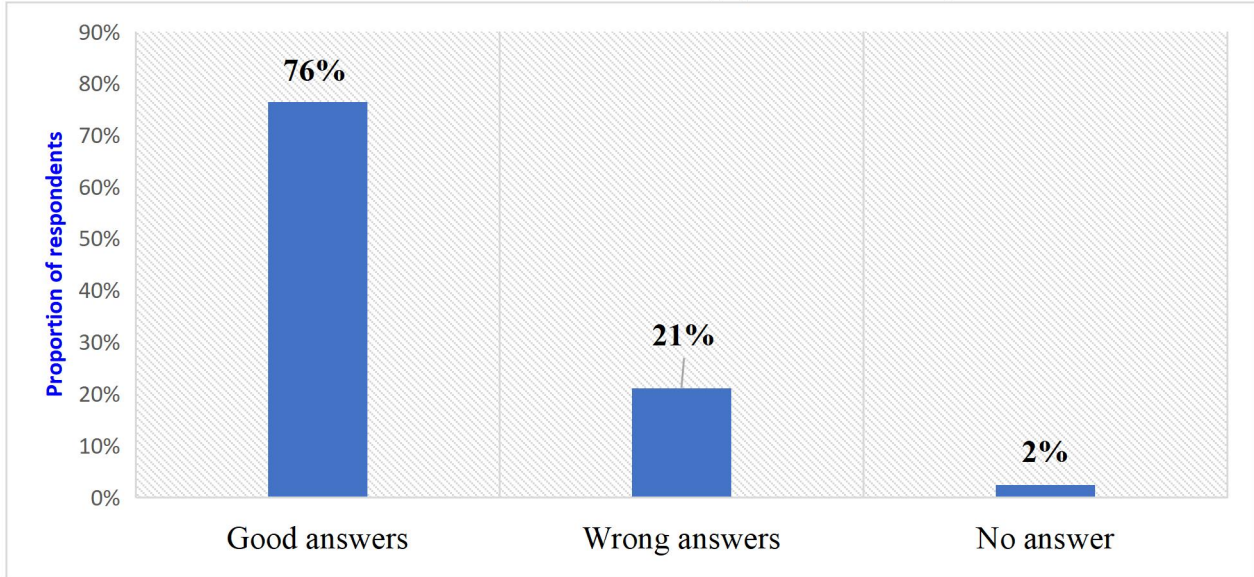


Figure 4: Causes of flooding

4.1.3. Impact of flooding

Thirdly, we asked what are the impacts of a flood?

The answers given by the children included: "Risk of death, destruction of houses, risk of drowning, kill people, remove roofs from houses, flood destroys houses, take people away, concessions may fall, food taken away, death, destruction of equipment and houses, spoil the road and make it difficult for people to move around, remove roofs from houses, uproot trees and make houses fall, cause death, injure people". As for the wrong answers, they are "Vulnerability of transport and communication routes, increased poverty". The proportions of respondents in the graph below.

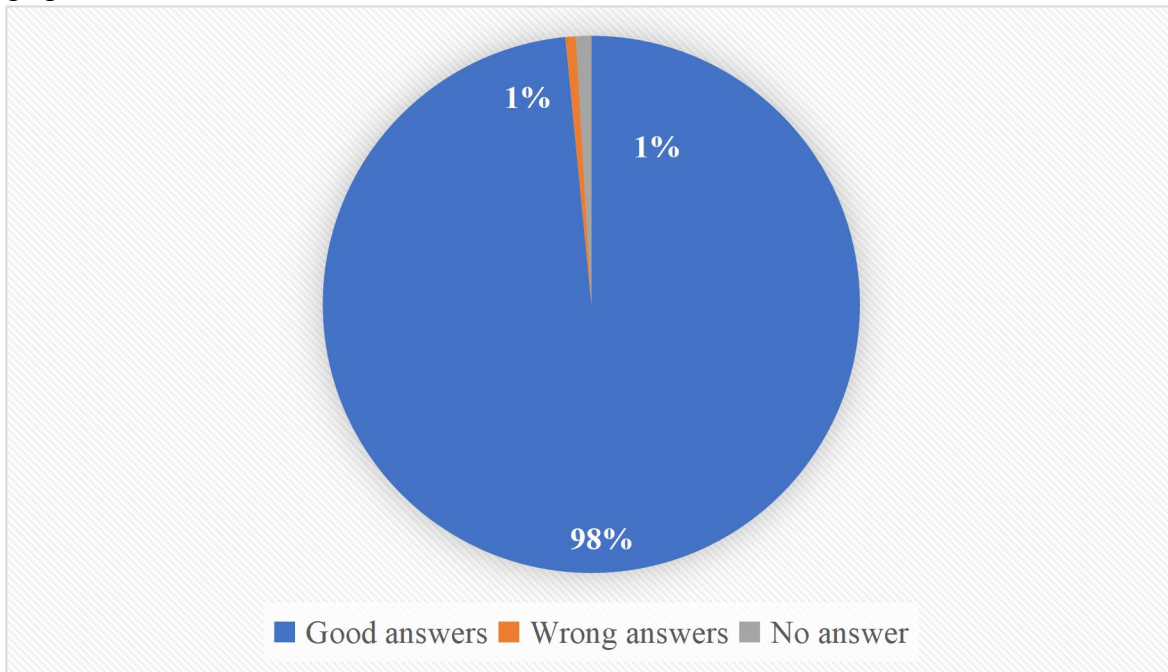


Figure 5:Impact of flooding

4.3. Students' vulnerability to the impacts of flooding

In order to measure the degree of exposure of students to the harmful effects of flooding, a number of questions were asked. The questions were Do you know if your school is in a flood zone?

In response to this question, the students said they didn't know if their school was in a flood zone. The graph opposite shows the proposed answers: 81.61% answered and 18.39% said yes to the question. In our opinion, the very lack of knowledge is a risk factor.the figure 6 shows the respondents' knowledge of their school's status.

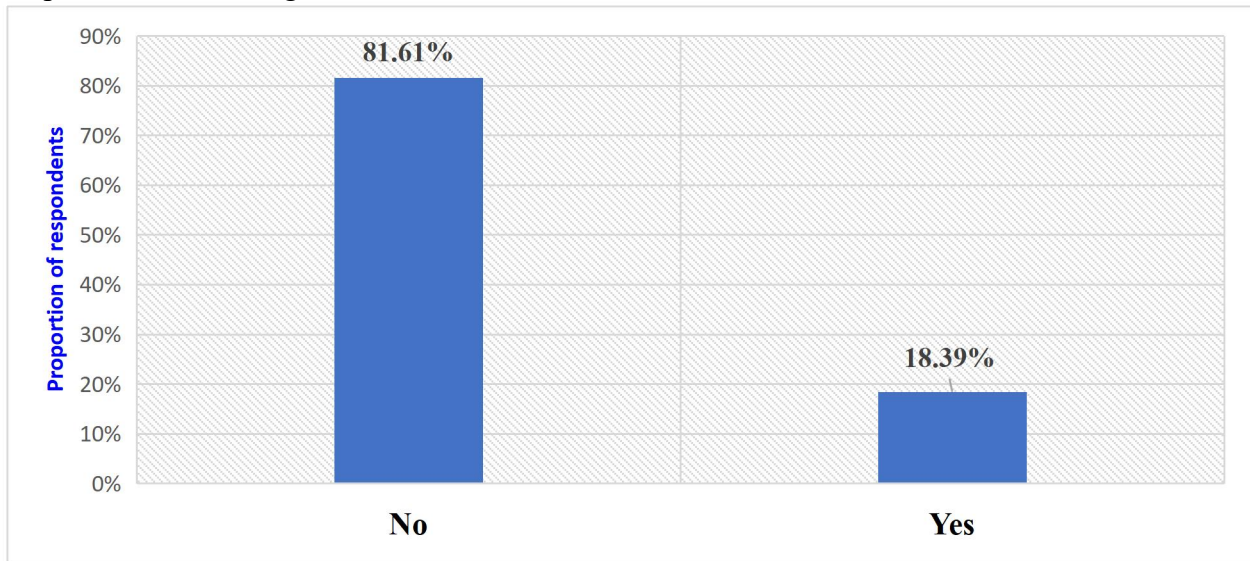


Figure 6:Respondent's knowledge of their school's status

Have you ever been made aware of the effects of flooding?

86.58% of students say they have not received any awareness or training on the effects of flooding. Only 13.42% had received either awareness or training on the effects of flooding.

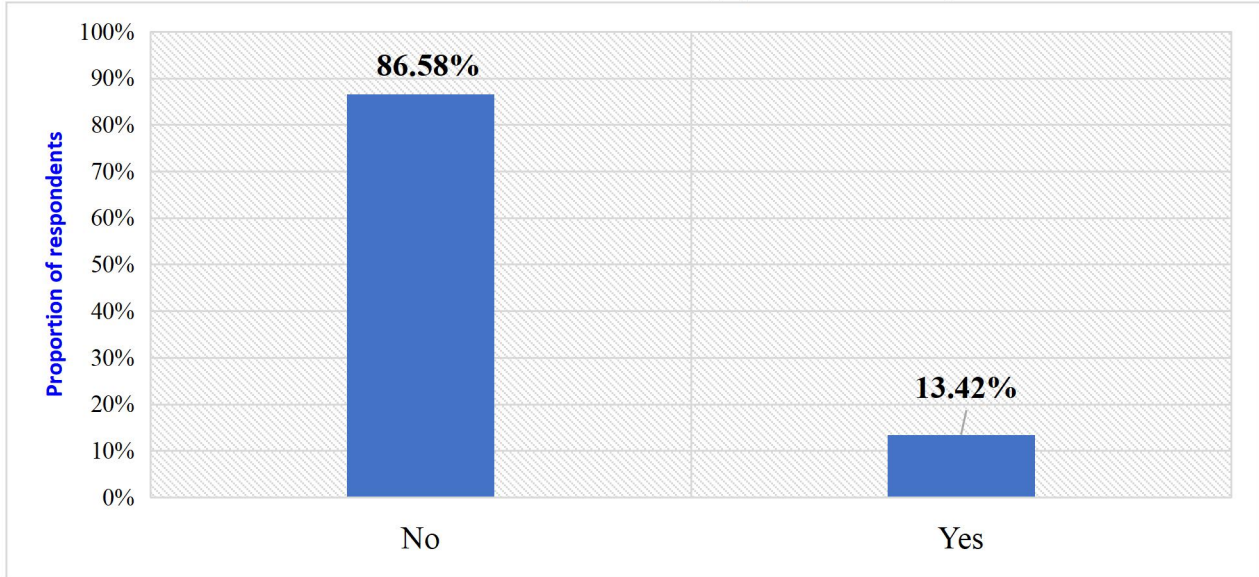


Figure 7:raising awareness of the impact of flooding

Of those who have received training or education, more than 70% say they receive it annually, about 20% quarterly, and less than 5% monthly.

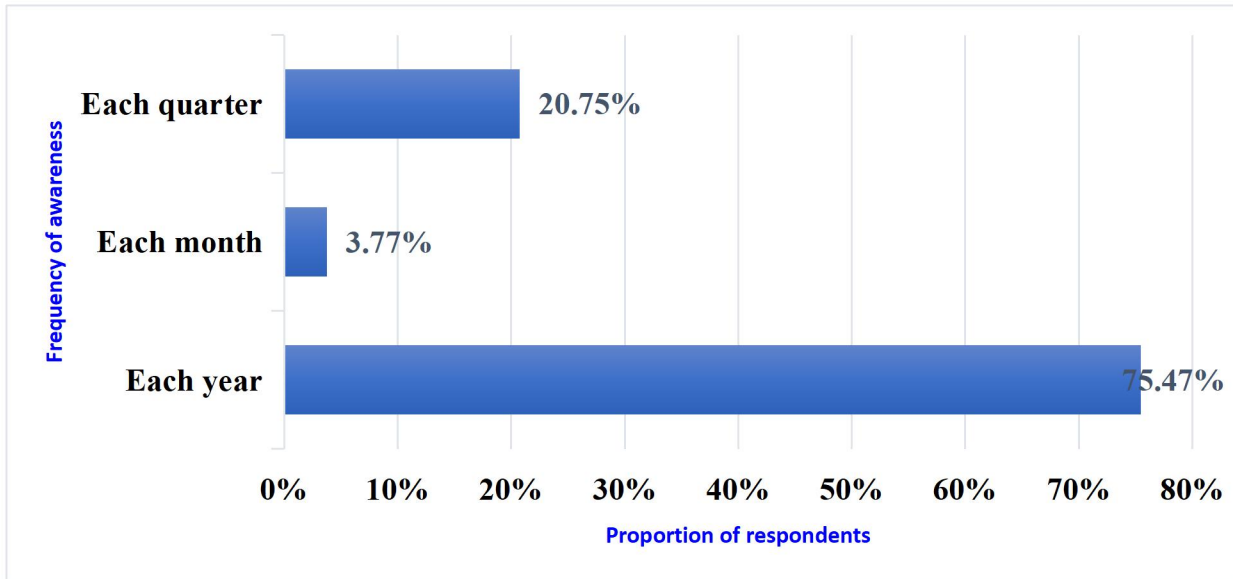


Figure 8:Frequency of awareness

Have you had any environmental education awareness or training? 74.41% of the students say that they have not had any awareness or training in environmental education. Only 25.59% had received either awareness or training in environmental education.

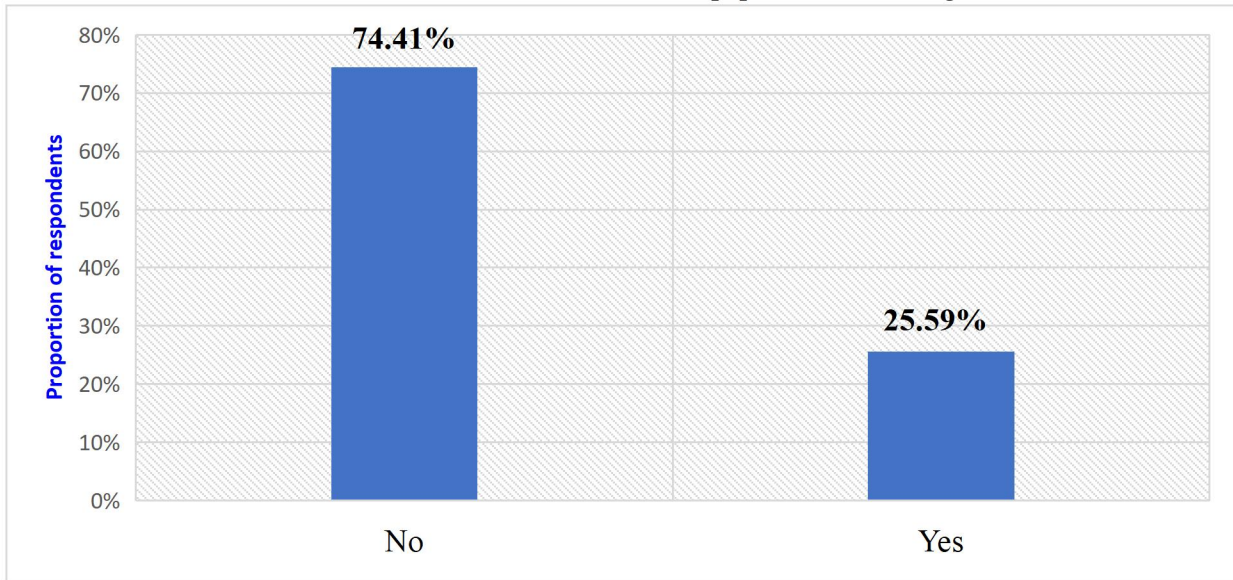


Figure 9:Awareness-raising or training in environmental education

Of those who have received training or awareness, more than 68.69% say it was annual, about 19.19% quarterly, and less than 12.12% monthly.

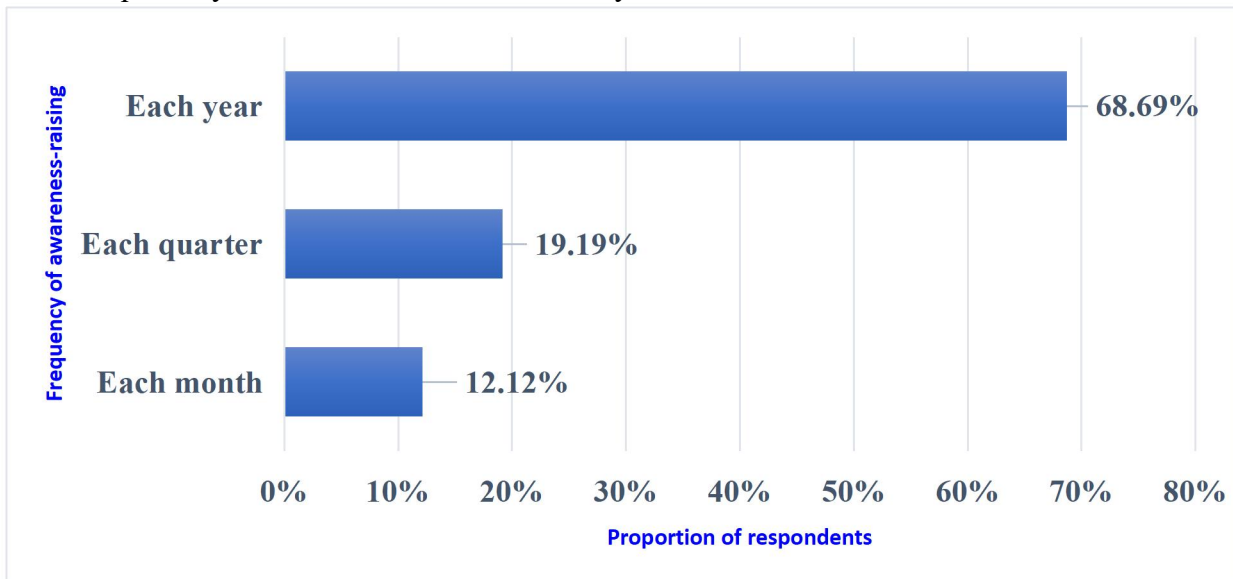


Figure 10:Frequency of awareness-raising or training in environmental education

Have you ever been made aware of the risks of natural disasters?

We asked the children if they had ever been made aware of the risk of natural disasters and 93.66% said they had never been made aware and only 6.04% said they had been made aware. This very interesting result shows that there is a greater need for children to be made aware of the risk of natural disasters. Of the approximately 6% of students who have been made aware, their level of awareness could be increased through training and sensitization.

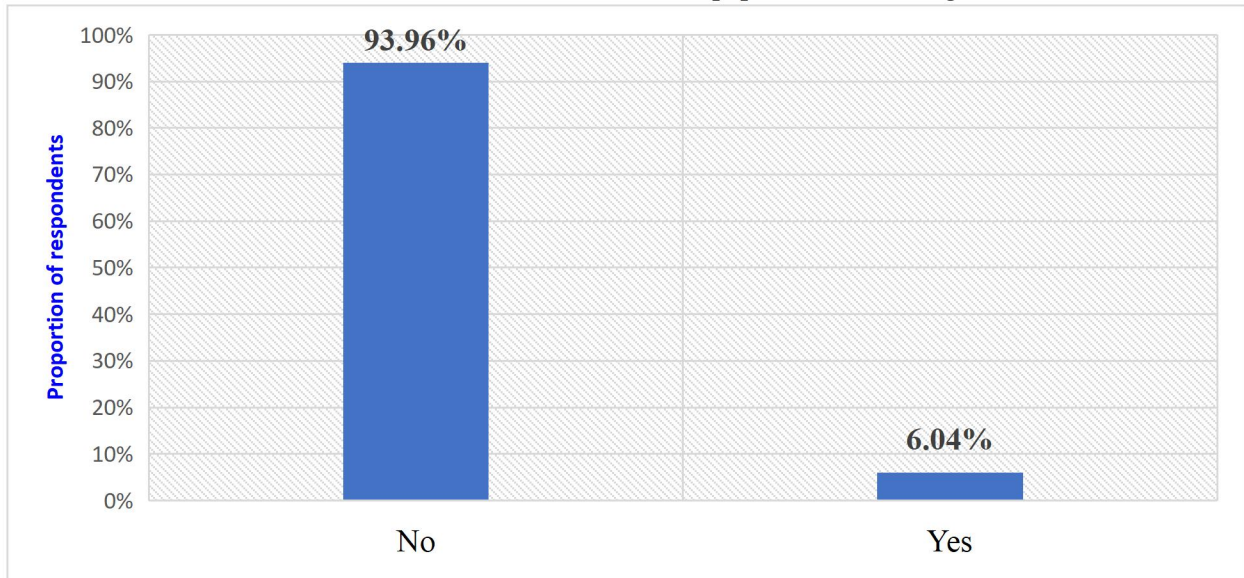


Figure 11: Raising awareness of the risks of natural disasters

4.2. Level of education and awareness of disaster risk reduction among students

To understand the students' level of education and awareness of disaster risk reduction, we asked them a series of questions. We asked them if they knew of any documents dealing with flooding or climate change, and if so, to cite these documents, as well as if they had ever seen a flood map of the commune of Ouagadougou, or if they had ever received training on the effects of flooding. 96.88% of the respondents said that they did not know any documents dealing with floods, while the 3.12% who said that they did know documents dealing with floods.

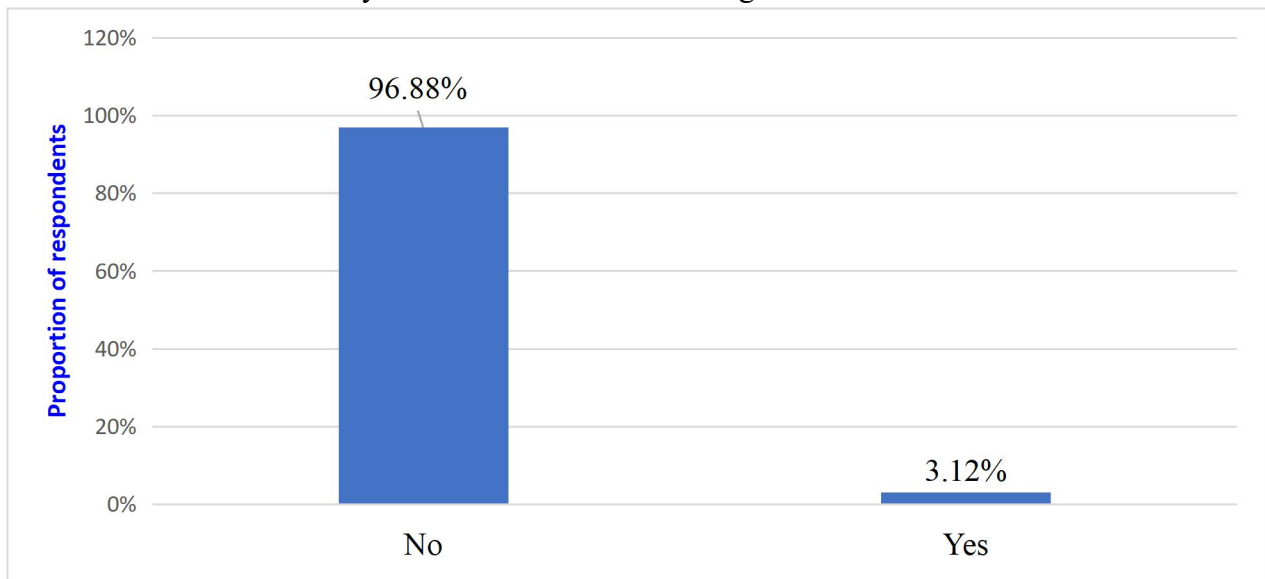


Figure 12: Proportion of respondents

The 3.12% who said that they did know documents dealing with floods mentioned the following documents Geography book, textbook, text study, The Great Rain Nation, observational science.

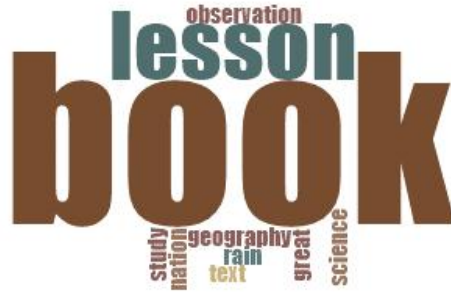


Figure 13: Documents dealing with floods

Do you have documents on climate change? If so, what documents? In response to this question, 86.65% of the students said that they did not have any documents on climate change against 13.35% who did.

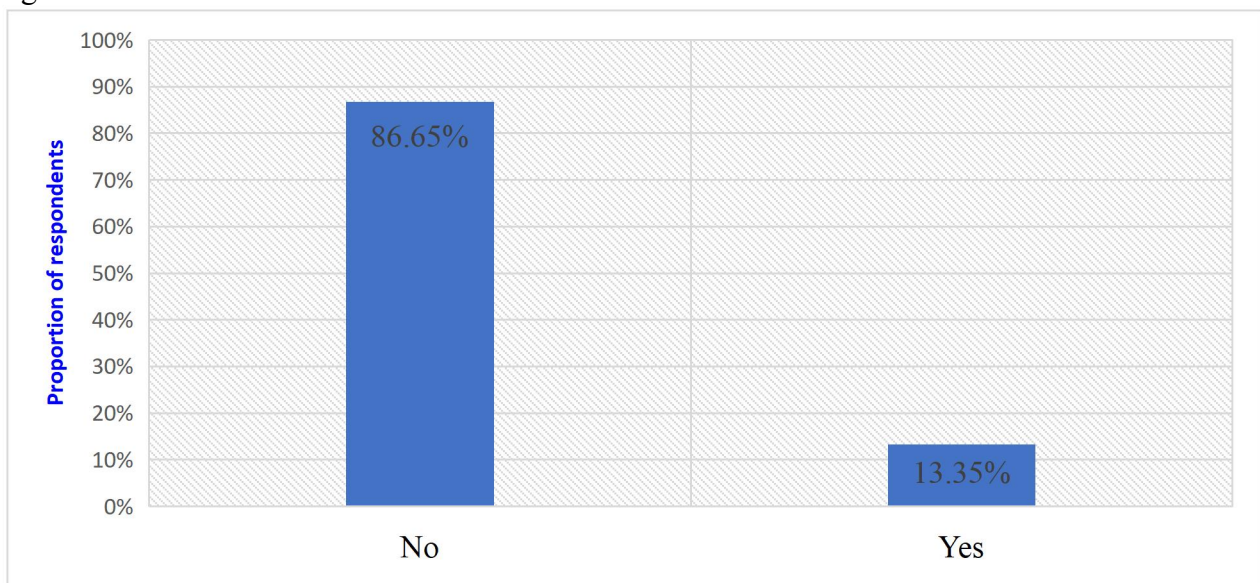


Figure 15: Documents on climate change

The 13.35% who did, mentioned the following books: a geography book, a book on observational science, a book on the climate of Burkina Faso, etc.

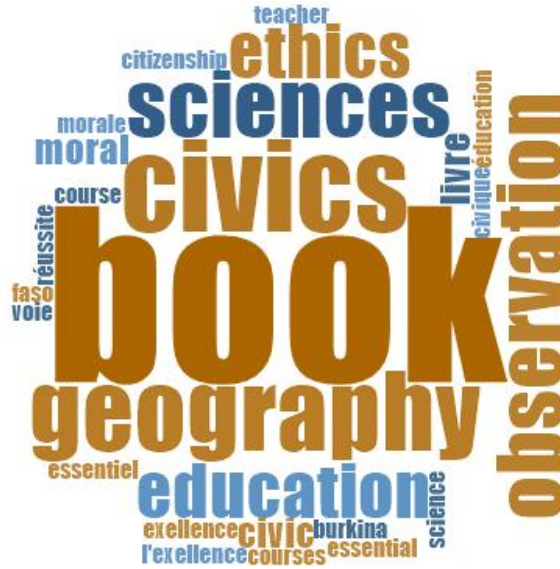


Figure 16: Document that talks about climate change

Do you have any documents on environmental education? 83.81% of respondents to the question of whether they have documents on environmental education said no, and the 16.19% who said yes cited the following reference documents the essentials and the path to success yearbook, the excellence yearbook, the civics and ethics course and the observation science book.

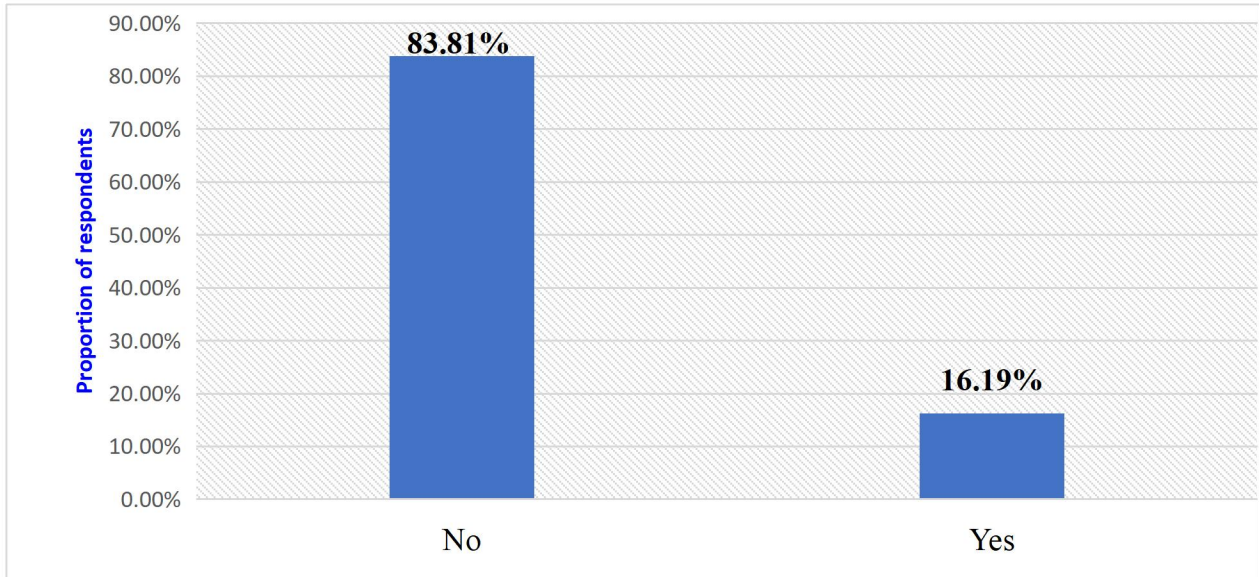


Figure 17: Documents on environmental education

The 16,19 % who said yes cited the following reference documents the essentials and the path to success yearbook, the excellence yearbook, the civics and ethics course and the observation science book.

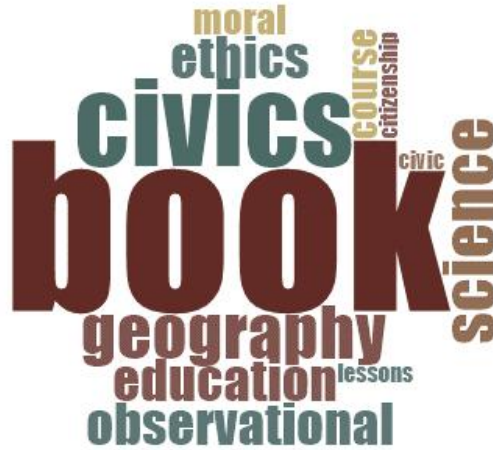


Figure 18: Document that talks about environmental education

Have you ever seen a map of flood-prone areas in Ouagadougou?

All the students we interviewed said that they had never seen a flood map of Ouagadougou. As far as we're concerned, there are two possibilities: either the map exists and is inaccessible, or it doesn't exist for the general public.

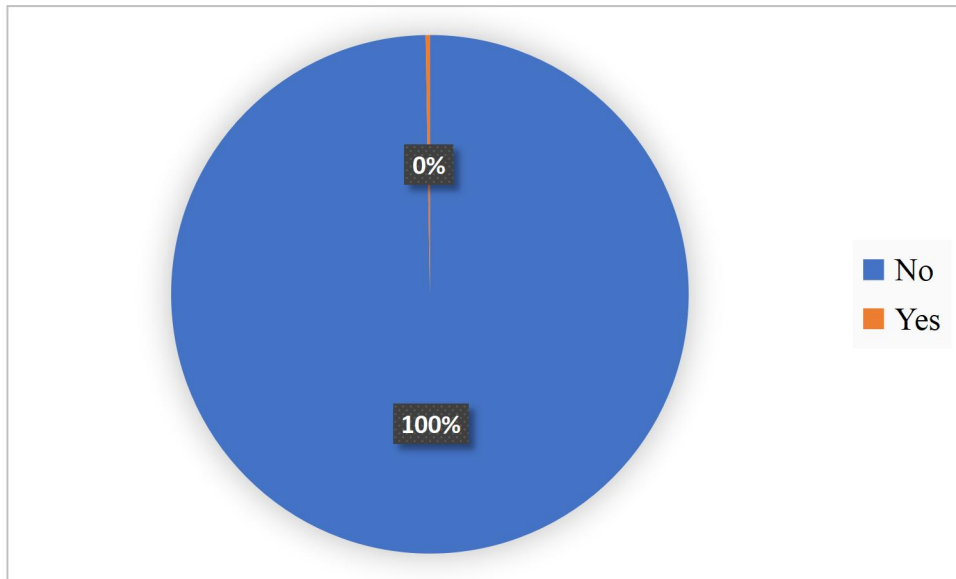


Figure 20: Ouagadougou municipality map of flood-prone areas

We wanted to know whether pupils had received training on the impact of flooding. For the question asked, 97.38% of schoolchildren said that they had not received training on the impact of flooding, compared with 2.62% who had.

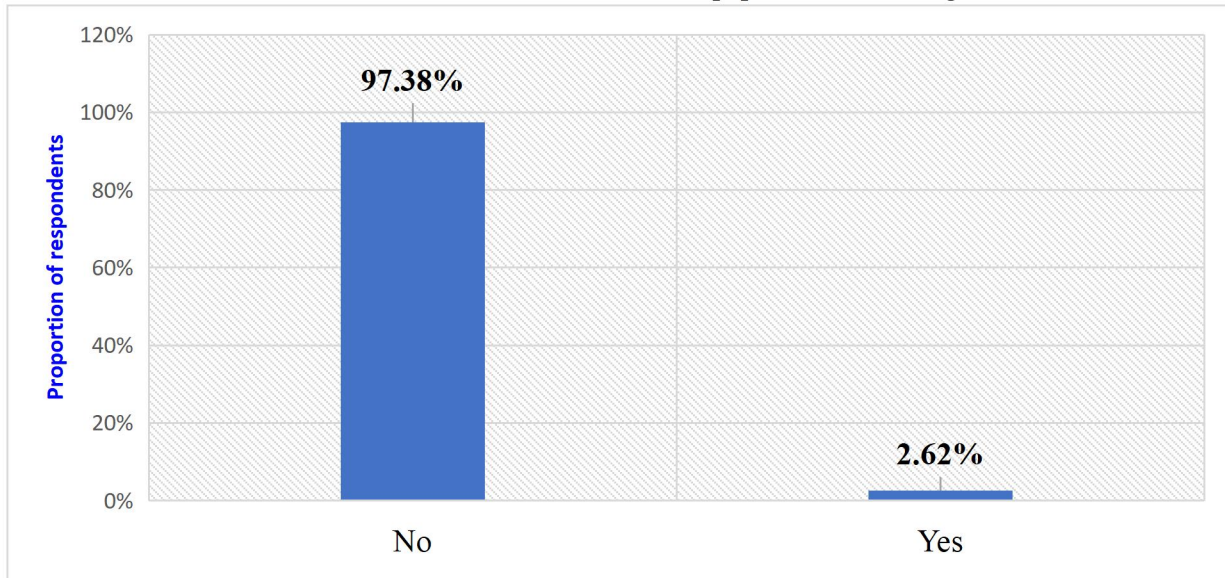


Figure 21: Pupils had received training on the impact of flooding

5. Discussion

Flooding is a real problem of global warming in Africa. We assessed students' knowledge of the effects of flooding in a primary school in the commune of Ouagadougou. The students' responses to the definition, causes, and effects of flooding (94.5%, 76.4%, and 98%, respectively) showed that they were familiar with the issue of flooding, but that they had not received any specific training. These results are similar to (Tempels, 2016), who pointed out that personal experience is significantly associated with flood awareness in the Dender Basin. Similarly, Flemish primary school children (Goosse, 2020). Flood education is not part of the primary school curriculum in Burkina Faso, and this is also reflected in the studies of (Goosse, 2020) that flooding is not explicitly the main subject of the Flemish curriculum. The majority of pupils are very aware of the risk of flooding (Ponstingel et al., 2019). The study of (Shepard et al., 2018) revealed that 58% of floods are caused by global warming. As a result, students associate flooding with precipitation (37.9%) (Hutton & Allen, 2021) while the population of (Oyatayo et al., 2016) Attributes 46.2% of flooding to precipitation. Likewise, (Oyatayo et al., 2016) said that the proximity of the main river and rainfall were the main causes of flooding. The study of (Hutton & Allen, 2021) stated that (60.8%) of students had a lesson cancelled or were unable to attend a lesson due to flooding.

From this we can say that students acquired knowledge about floods from other sources such as the media, family discussions or even empirical knowledge i.e. knowledge about floods from personal experience.

6. Conclusion

This study assesses the level of awareness of disaster risk reduction in general and the impact of flooding in particular among primary school pupils in the city of Ouagadougou. The study highlights the undeniable importance of education in natural risk mitigation.

The results show that there are shortcomings in children's understanding of the impact of flooding, but also highlight opportunities for improvement. The surveys revealed that pupils have an empirical knowledge of flooding. Indeed, when we asked whether they knew the definition of flooding, over 90 per cent were able to answer correctly, but with a lot of trial and error and explanation. The same applied to the causes and impacts of flooding. However, children are vulnerable to the impact of flooding. More than 90 per cent do not know whether their school is in a flood-prone area, and more than 80 per cent say that they have never been made aware of or trained in the impacts of flooding, environmental education or the risks of natural climatic disasters.

In view of the results, it is crucial to step up the frequency of awareness-raising campaigns, using teaching methods that are appropriate to their age and, above all, to the local context. Investing in training schoolchildren about flood risks will not only increase their resilience and flood mitigation capacity, but will also help to forge young people who are more aware of and ready for the challenges posed by natural disasters such as the frequent flooding in our Sahelian countries. We therefore recommend that the education authorities, i.e. MENAPLN and its technical and financial partners, put in place a more comprehensive and integrated education programme to ensure that young schoolchildren are better trained to face the challenges of flooding and other natural climatic disasters.

Bibliography

- Bianca, R. S., & Tiana, T. T. J. et R. H. L. (2022). Essai d'évaluation des effets du changement climatique sur les inondations: cas de Mahajanga.
- Bronfort, S. (2017). Les stratégies d'adaptation face au risque d'inondation dans les zones d'habitat spontanés de Ouagadougou, Burkina Faso. <http://hdl.handle.net/2268.2/3317>
- Chindji, M. (2023). Les inondations dans les bas-fonds de la commune de yaoundé 6 (centre-cameroun) : état des lieux et perspectives. 6(October).
- Fédération internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge. (2018). Sensibilisation et éducation du public à la réduction des risques de catastrophe : un guide. 88. http://www.ifrc.org/Global/Publications/disasters/reducing_risks/1270200-Sensibilisation Education Public-FR-LR.pdf
- Goosse, T. (2020). Report 5 . A : Increase flood awareness through a school program.
- Guilyardi, E., Lescarmonier, L., Matthews, R., Pen Point, S., Rumjaun, A. B., Schlüpmann, J., & Wilgenbus, D. (2019). Rapport spécial du GIEC "Réchauffement à 1,5 °C" - Résumé à destination des enseignants. 24.
- Hangnon, H., De Longueville, F., & Ozer, P. (2015). Précipitations extrêmes et inondations à Ouagadougou : Quand le développement urbain est mal maîtrisé XXVIIIe Colloque de l'Association Internationale de Climatologie, 1, 497–502.
- Hutton, N. S., & Allen, M. J. (2021). Flood Hazard Awareness at Old Dominion University: Assessment and Opportunity. *Journal of Contemporary Water Research & Education*, 172(1), 19–33. <https://doi.org/10.1111/j.1936-704x.2021.3352.x>

- Justine, S. (2017). Impact de l' inondation sur le systeme educatif : cas du fokontany ampefiloha ambodirano présenté par :2017.
- Khalifa, D. (2015). Contribution à l'étude de l'aléa " inondations": Genèse et prédiction Cas de la vallée d'El-Abadia (w.Ain Defla). 112.
- Mamadou Ibrahim, M. A. A. K. (2023). Inondation dans la ville de Goure au Niger : facteurs , vulnérabilité , impacts et réponse locale. June. <https://doi.org/10.5281/zenodo.8104426>
- Nations Unies. (2005). Cadre d'action de Hyogo pour 2005-2015: Pour des nations et des collectivités résilientes face aux catastrophes. Nations Unies, 6–30. <https://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-french.pdf>
- Oyatayo, K. T., Songu, G. A., Adi, T. A., Jidauna, G. G., & Ndabula, C. (2016). Assessment of People's Awareness and Perception of Flooding in Donga Town, Taraba State, Nigeria. *Journal of Geoscience and Environment Protection*, 04(05), 54–62. <https://doi.org/10.4236/gep.2016.45006>
- Ponstingel, D., Lopez, C. W., & Earl, R. A. (2019). Flood awareness among college students in flash flood alley: a case study of Texas State University in San Marcos, Texas, USA. *Applied Geography*, 5(3–4), 236–255. <https://doi.org/10.1080/23754931.2019.1694966>
- RGBF. (2010). Inondations du 1 er Septembre 2009 au Burkina Faso (Issue 56803).
- Shepard, S., Boudet, H., Zanocco, C. M., Cramer, L. A., & Tilt, B. (2018). Community climate change beliefs, awareness, and actions in the wake of the September 2013 flooding in Boulder County, Colorado. *Journal of Environmental Studies and Sciences*, 8(3), 312–325. <https://doi.org/10.1007/s13412-018-0479-4>
- Tempels, B. (2016). Flood Resilience: a Co-Evolutionary Approach Residents, Spatial Developments and Flood Risk Management in the Dender Basin. The research reported in this dissertation was conducted at the Centre for Mobility and Spatial Planning.
- UNESCO. (2022). Éducation au changement climatique UNESCO. <https://www.unesco.org/fr/education/sustainable-development/climate-change>
- UNICEF. (2022). Analyse des risques et de l' impact des aléas sur les enfants.
- Usmaningtyas Ayu Dwi Septiningrum, Y. A. W., Puspita, and R., & Dewi. (2022). An Analysis of Elementary School Vulnerability in. 662(Icolae 2021), 991–1001.