



Décalage entre connaissances empiriques et éducation formelle face aux inondations : une étude transversale auprès d'élèves du primaire à Ouagadougou (Burkina Faso)

*Discrepancy between empirical knowledge and formal education regarding floods:
a cross-sectional study of primary school pupils in Ouagadougou (Burkina Faso)*

Halidou KAFANDO

Université Joseph Ki-Zerbo, Burkina Faso

Email : kafandobangba8819@gmail.com

Orcid id : <https://Orcid.org/0009-0000-0215-8053>

Vincent Nduka OJEH

Université d'État de Taraba, Nigéria

Email : vinceojehnetwork@gmail.com

Orcid id : <https://Orcid.org/0000-0003-2147-1824>

Blaise OUEDRAOGO

Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso

Email : blaise32fr@yahoo.fr

Adama Boua DOUMBIA

Université de Gambie, Gambie

Email : adabouadoumbia@gmail.com

Gustavo J. NAGY

Université de la République d'Uruguay, Uruguay

Email : gnagy@fcien.edu.uy

Orcid id : <https://Orcid.org/0000-0002-8296-4465>

Mihaela SIMA

Académie Roumaine, Institut de géographie, Roumanie

Email : simamik@yahoo.com

Orcid id : <https://orcid.org/0000-0002-2069-3639>

Résumé : Cette étude évalue le niveau de connaissances, de sensibilisation et de préparation des élèves du primaire de la commune de Ouagadougou en ce qui concerne les impacts des inondations. Les données ont été recueillies auprès de 387 élèves (âgés de 8 à 14 ans) fréquentant 60 écoles primaires publiques et privées dans les 55 secteurs de Ouagadougou, à l'aide d'un questionnaire adapté aux élèves de CE2, CM1 et CM2. L'enquête portait sur la définition et les causes des inondations, les impacts perçus, l'exposition et la préparation, ainsi que l'accès à l'éducation et au matériel pédagogique sur les risques de catastrophe. Les résultats montrent que 94,5 % des élèves produisent une description phénoménologique des inondations, bien que 68 % aient nécessité des relances de l'enquêteur pour formuler une réponse complète et 76,4 % identifient avec précision leurs causes. Cependant, ce niveau élevé de reconnaissance phénoménologique des inondations contraste fortement avec les niveaux très faibles d'éducation formelle et de préparation. En effet, 81,6 % des élèves ne savaient pas si leur

école était située dans une zone inondable, 86,6 % n'avaient jamais reçu de formation ou d'éducation sur les impacts des inondations et 93,7 % n'avaient jamais été sensibilisés aux risques de catastrophes naturelles. En outre, 97,4 % ont déclaré n'avoir reçu aucune formation sur les conséquences des inondations, 96,9 % ignoraient l'existence de supports pédagogiques sur le sujet et 100 % n'avaient jamais vu de carte des risques d'inondation de Ouagadougou. Ces résultats suggèrent que les connaissances des élèves pourraient être principalement empiriques plutôt que issues d'un enseignement formel ; hypothèse à valider par des entretiens qualitatifs explorant les sources précises de ces connaissances.

Mots-clé: Réduction des risques de catastrophe, sensibilisation aux inondations urbaines, impact des inondations, école primaire, Ouagadougou (Burkina Faso)

Abstract: This study assesses the level of knowledge, awareness and preparedness of primary school pupils in the municipality of Ouagadougou with regard to the impacts of flooding. Data was collected from 387 pupils (aged 8 to 14) attending 60 public and private primary schools across 55 sectors of Ouagadougou, using a questionnaire adapted for pupils in grade 4,5,6. The survey focused on the definition and causes of floods, perceived impacts, exposure and preparedness, as well as access to education and teaching materials on disaster risks. The results show that 94.5% of pupils correctly define flooding and 76.4% accurately identify its causes. However, this relatively high level of conceptual knowledge contrasts sharply with very low levels of formal education and preparedness. In fact, 81.6% of students did not know whether their school was located in a flood zone 86.6% had never received awareness training or education on the impacts of flooding and 93.7% had never been made aware of the risks of natural disasters. In addition, 97.4% said they had not received any training on the consequences of flooding, 96.9% were unaware of the existence of educational materials on the subject and 100% had never seen a flood risk map of Ouagadougou. These findings suggest that pupils knowledge of floods may be primarily experiential rather than derived from formal schooling, warranting further investigation into knowledge sources (family transmission, media exposure, lived experience).

Keywords: Disaster Risk Reduction, Urban Flood awareness, Impact of flooding, Primary school, Ouagadougou (Burkina Faso)

Introduction

Since the 1970s, natural disasters linked to extreme weather events have been increasingly observed in the West Africa Sahel, attributed to climate change (Mamadou Ibrahim, 2023, p.1). Flooding is a hazard that affects many cities in developing countries, with many shortcomings in urban development and planning (Chindji, 2023, p.2). 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, p.3).

The elementary school environment is one of the priorities for disaster risk reduction due to children's higher vulnerability. 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, p.4) influence the impact of flooding and the school's adaptive capacity. Reducing flood damage and ensuring the safety of people and property requires clear identification of the areas at risk of flooding and the factors contributing to or amplifying the extent of damage and loss caused by these disasters (Khalifa, 2015, p.112). However, the effectiveness of education as a standalone strategy remains contested when structural drivers of vulnerability (unregulated urbanization, land tenure insecurity) remain unaddressed (Wisner, 2004, p.11). While education is widely promoted as an essential pillar of disaster risk reduction, its transformative capacity depends on its ability to be rooted in local realities. In contexts where children face recurrent flooding, they can acquire empirical knowledge based on observation, family practices and community adaptation strategies.

This study therefore interrogates the conditions under which education can meaningfully contribute to flood risk reduction in Ouagadougou's context of spontaneous settlement expansion. The impact of flooding on the education system in Fokontany Ampefiloha and Ambodirano (Justine, 2017, p.15) reminded us that the Ministry of Education has a significant 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. 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 unwilling to attend school because the teaching infrastructure is almost destroyed. Some pupils do not attend school because of food scarcity or infectious diseases associated with a flood (e.g., diarrhoea, cholera), leading to increased absenteeism during the crisis (Justine, 2017, p.17).

From the 2000s onwards, flooding has become a recurrent (every year) phenomenon in Ouagadougou. According to documentary research 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 per year. These floods caused loss of life, casualties, injuries, house collapses and other significant damage to economic infrastructure (Hangnon et al., 2015, p.4). The impact of climate change on 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, p.7).

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, p.63), usually along the rivers, strongly exposed to flood hazard. The 2009 floods damaged 351 schools out of a national total of 4,988, a rate of 7.03%. The floods led to a high dropout rate during the 2009-2010 school year, driven by household displacement, 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 start of classes on Friday, October 2, 2009, in all schools nationwide due to disinfection and rehabilitation work in some schools (RGBF, 2010, p.25).

Despite this recurrent exposure, little is known about the potential gap between the empirical knowledge developed by primary school pupils through lived flood experiences and the formal knowledge transmitted through the official curriculum. This possible misalignment raises a critical research question: To what extent does a gap exist between empirical knowledge and formal school-based education regarding flood risk among primary school pupils in Ouagadougou? This study aims to assess the level of awareness and knowledge among primary school pupils in Ouagadougou of the impact of flooding. Specifically, the study seeks to (1) evaluate the pupils' understanding of the definition and causes of flooding; (2) assess their awareness of the impacts of flooding; and (3) explore the challenges and gaps in pupils' awareness of flood risks. Methodologically, the study adopts a mixed approach combining structured questionnaires administered to pupils, semi-structured interviews with teachers and a documentary analysis of official school curricula and school textbooks. To address the issue of the gap between empirical knowledge and formal education regarding flooding, this study focuses on three main points. The first part presents the context, issue, research question, and objective. The second part describes the methodology adopted and ethical considerations. Finally, the third part presents the results and discussions before concluding.

1. Methodology

1.1. Study Area and Survey area

Our study area is the commune of Ouagadougou, located in the province of Kadiogo, in the central part of Burkina Faso (Fig. 1). It consists of twelve (12) districts divided fifty-five (55) sectors. It is Burkina Faso's capital and the country's largest city. Ouagadougou is a municipality with special status.

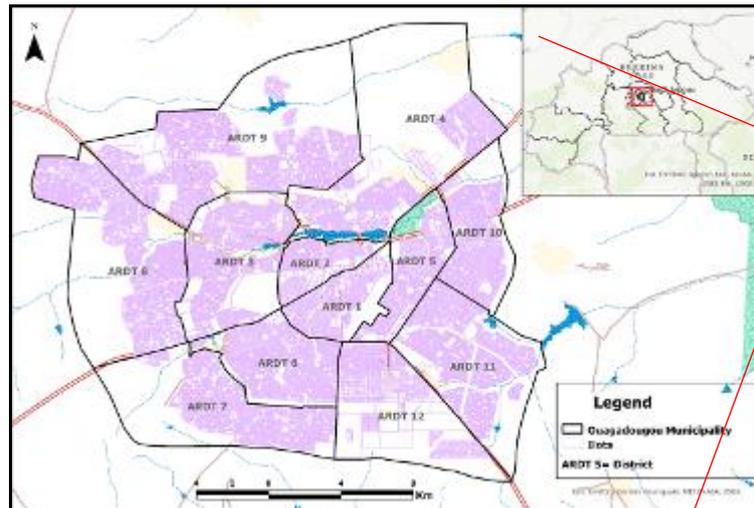


Figure 1: Map of the study area (source: authors)

It covers an area of 518 km² (SDAGO, 2010, p.12), representing 0.2% of the national territory. It is bordered to the north by the rural communes of Pabré 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. It is located at latitude 12°21'56" North and longitude 1°32'01" West. Ouagadougou is in the centre of the country and is crossed by the railway line from Abidjan in Côte d'Ivoire. As a result, it occupies a favourable geographical position for trade. It is a hub for trade in agricultural products and livestock with the rest of Burkina Faso on the one hand, and neighbouring countries on the other. Border countries such as Côte d'Ivoire, Benin, Niger, Togo, Ghana and Mali offer significant potential outlets for these products (INSD, 2022, p.8)¹.

The different areas surveyed are the 12 Basic Education Districts (BED) covering the city of Ouagadougou. Within the commune is 1 Basic Education District (BED) in each district. In other words, in District 1, we have Basic Education District (BED) 1, and so on. In this sense, we conducted the surveys in the 12 districts of the Ouagadougou commune. The map in Figure 2 shows the different schools the interviewers attended.

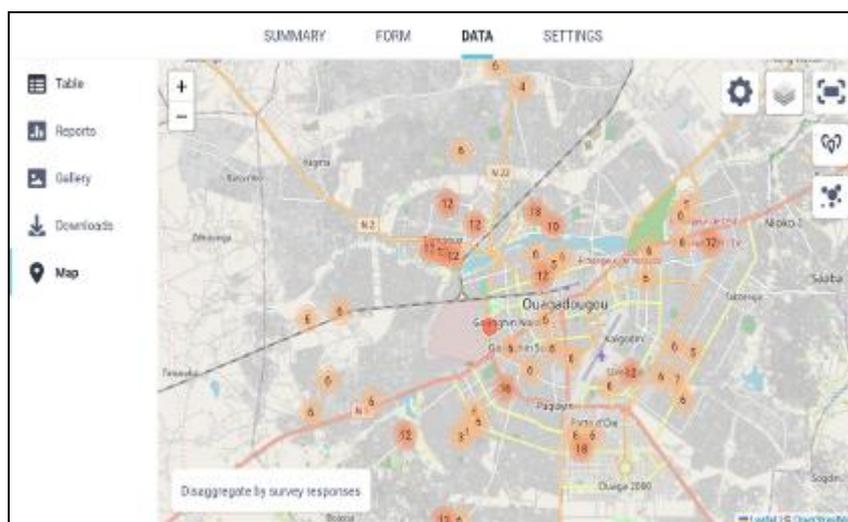


Figure 2: Map of surveyed sites (source: authors)

¹ RGPH 2019 - Monograph on the municipality of Ouagadougou

Figure 2 highlights the locations where investigators collected data, illustrating the geographical distribution of the establishments surveyed in the urban municipality of Ouagadougou. This distribution reflects the effort to include schools from different neighborhoods of the city, thus ensuring that the information collected reflects the diversity of environmental conditions and flood risks faced by primary schools.

1.2. Research design, data processing tools and ethics statement

This study employed a descriptive research design. Within each school, the two highest-performing pupils per grade were selected by teachers to ensure comprehension of the questionnaire. While this approach maximised response quality, it likely overestimated pupils' knowledge levels. Sensitivity analysis by grade level (Table 1) partially mitigates this bias, but results should be interpreted as reflecting the upper bound of pupils' awareness rather than population averages. Our objective was to reach 360 pupils in the Ouagadougou commune, but ultimately, we succeeded in interviewing 387 pupils. To achieve the data collection objectives, we recruited and trained 24 interviewers. In fact, two interviewers were mobilised per district to identify the BED and the schools in that BED to carry out the survey.

The study is based on a questionnaire survey 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. Initial validation by education professionals was complemented by cognitive pre-testing with 15 pupils (excluded from the final sample) to ensure item comprehension. Key adaptations included replacing technical terms («flood-prone zone») with child-friendly formulations («places where water rises a lot when it rains»). Despite these efforts, the absence of formal psychometric validation remains a limitation. Finally, we collected their suggestions and modifications, which we incorporated into the final version of the questionnaire.

The questionnaire consisted of closed questions, i.e. we asked questions and suggested answers for the pupils. Semi-closed questions, i.e. if the pupil had an answer other than the suggested one, they suggested their answer; and open questions, i.e. we asked a question, and it was up to the pupil to find the answer. You should mention the general structure of the questionnaire; what were the targeted topics/questions? You should also mention some studies that helped you design the general structure of the questionnaire

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

This study involves collecting data from men, women, and especially children. We explained the study's aim and its scientific and socio-economic implications. All the participants gave their consent to the surveys and interviews voluntarily. No personal data was stored or could be linked to individuals. Secondly, the data was processed and analysed anonymously.

This study was approved by the Ministry of National Education, Literacy and Promotion of National Languages (MENAPLN) of Burkina Faso, through the Directorate General for Access to Formal Education (DG_AEF), under number 2023-002506/MENAPLN/SG/DG_AEF/DEPrim dated 13 November 2023. The study was conducted in accordance with the ethical principles set out in the Declaration of Helsinki.

2. Result

2.1 Socio-demographic characteristics of respondents

The questionnaire was administered to pupils in grade 4, grade 5 and grade 6 classes in public and private schools in the Ouagadougou community. We surveyed 5 schools in each Basic

Education District (BED), for a total of 60 schools, with 6 pupils per school, or 2 pupils per class. The goal was to reach 360 pupils in the commune of Ouagadougou, but in the end, we managed to interview 387 pupils (Table 1).

| Classes surveyed | Number of respondents | Percentages |
|------------------|-----------------------|-------------|
| grade 4 | 127 | 32.82% |
| grade 5 | 125 | 32.30% |
| grade 6 | 135 | 34.88% |
| Total | 387 | 100 |
| Gender | Number | Percentages |
| Male | 193 | 49.87% |
| Female | 194 | 50.2% |
| Total | 387 | 100 |

Table 1: Characteristics of respondents

The analysis of the gender distribution shows almost equal representation between boys and girls. In fact, 193 respondents are male (49.97%) while 194 are female (50.13%). This distribution reflects a perfect balance between the two genders in the sample. Such parity avoids gender bias in the analysis of the results and promotes a more accurate interpretation of students' knowledge of floods.

2.2. Student knowledge of flooding and its causes

2.2.1. Definition of flooding

When asked, "What is a flood?"; 94,5 % of the pupils described observable flood phenomena (e.g. water entering houses, collapsing buildings, flooded streets), 3,4 % could not recall a flood and 2,2 % did not answer. Responses capturing (table 2) a valid dimension of flooding but lacking specificity regarding hydrological mechanisms or local context were coded as incomplete rather than incorrect, acknowledging that children's knowledge is partial rather than erroneous.

| Level | Type of knowledge | Example answer | Responses (%) |
|---------|-------------------|--|---------------|
| Level 1 | Phenomenological | Describes observable effects: There is water in the houses, houses are collapsing, and streets are flooded. | 94,5 % |
| Level 2 | Causal | Identifies mechanisms: Heavy rains cause rivers to overflow, and drainage is insufficient | 28,3 % |
| Level 3 | Systemic | Links to anthropogenic/climatic drivers: Unplanned urbanisation and climate change are exacerbating flooding | 0 % |

Table 2: Level of knowledge of pupils

These results highlight a critical gap between recognition and understanding. While most pupils can describe flooding, far fewer grasp causal mechanisms and none link floods to broader systemic drivers.

4.2.2. Causes of flooding

The second question in our questionnaire was about the causes of flooding. For this question, 72.1% identified meteorological causes («heavy rain»), but only 31.4% identified anthropogenic causes («blocked gutters», «lack of drainage»). This gap suggests a limited understanding of actionable risk reduction measures, a critical finding for curriculum design. Some of the pupils' correct answers were "heavy rain, lack of gutters, silting of gutters preventing rainwater drainage, blocked gutters, lack of gutters, heavy rain and blocked gutters. The wrong answers include "death, over-cutting of wood, when a pipe breaks, houses fall, poor house construction.

2.3. Awareness of flooding impact

Thirdly, we asked what the effects of a flood are. 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 was 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". Children predominantly described immediate physical impacts (house destruction, drowning risk). Only 4.2 % mentioned socio-economic consequences (poverty, infrastructure vulnerability), not an error, but a reflection of their experiential horizon. This gap highlights the need for pedagogical tools that bridge immediate experience and systemic understanding."

2.4. Pupils' knowledge of exposure to flood risk

In order to measure the degree of exposure of pupils to the harmful effects of flooding, several questions were asked. The questions were, «Do you know if your school is in a flood zone?» Responding to this question, the students said they didn't know if their school was in a flood zone. The opposite graph shows the proposed answers: The results show that 81.61% of pupils say they do not know whether their school is located in a flood zone, while only 18.39% say they are aware that their school is located in such an area. The apparent lack of knowledge is a risk factor. Have you ever been made aware of the effects of flooding? 86.58% of pupils say they have not received any awareness or training on the impact of flooding. Only 13.42% had received either awareness or training on the effects of flooding. Have you had any environmental education awareness or training? 74.41% of the pupils said they had no awareness or training in environmental education. Only 25.59% had received either awareness 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. The near-universal absence of disaster risk awareness (93.7%) among pupils indicates a systemic gap in formal risk communication channels in Ouagadougou's primary schools. Of the approximately 6% of pupils who have been made aware, their level of awareness could be increased through training and sensitisation. **Table 2** shows the proportion of responses to the questions.

| | Yes (%) | No (%) |
|--|---------|--------|
| Do you know if your school is in a flood zone? | 18.4 | 81.6 |
| Have you ever been made aware of the effects of flooding? | 13.4 | 86.6 |
| Have you had any environmental education awareness or training? | 25.6 | 74.4 |
| Have you ever been made aware of the risks of natural disasters? | 6.0 | 94.0 |

Table 2: Questions related to pupils' awareness of flooding areas

Of those who have received training or education, more than 70% say they receive it annually, about 20% quarterly, and less than 5% monthly (Fig 3).

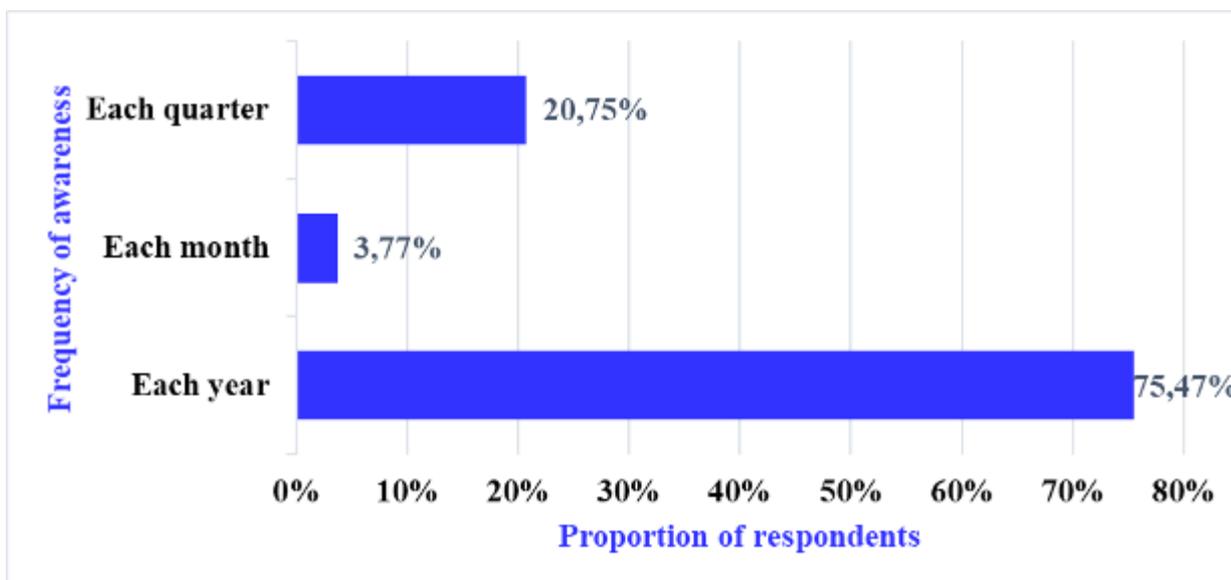


Figure 3: Frequency of awareness (source: authors)

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 (Fig 4).

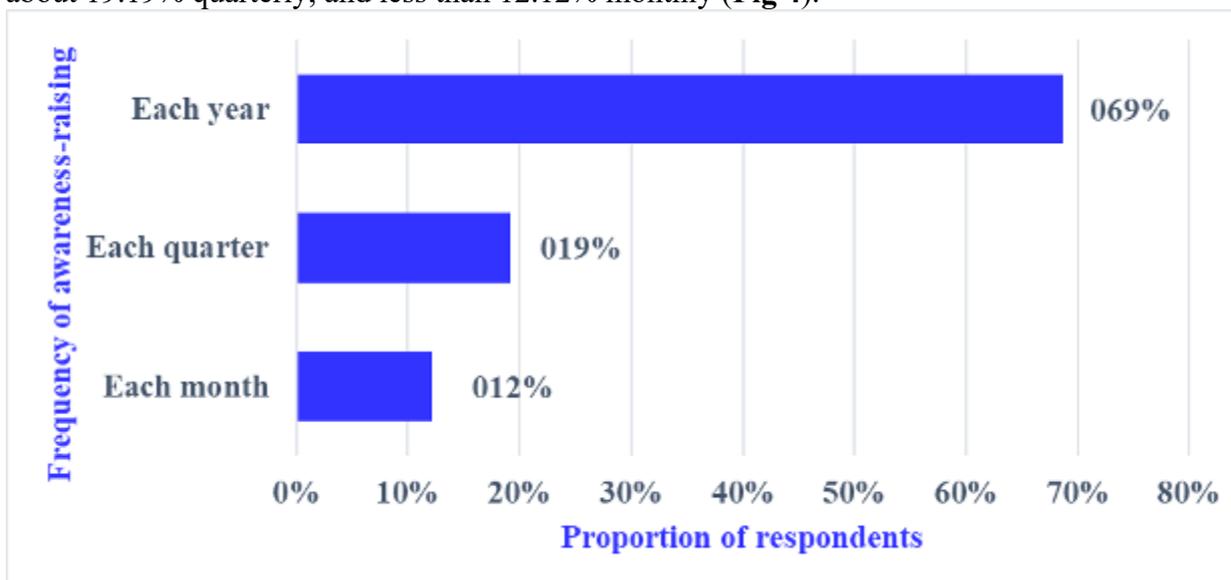


Figure 4: Frequency of awareness-raising or training in environmental education (source: authors).

2.5. Challenges and gaps in flood awareness among pupils

To understand the pupils' 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 them. We also asked if they had ever seen a flood map of the commune of Ouagadougou or had ever received training on the effects of flooding. 96.88% of the respondents said they did not know any documents dealing with floods, while 3.12% said they did know documents dealing with floods. The 3.12% who said they knew of documents dealing with flooding cited the following: Geography book, lesson book, text study, Great Rain Nation book, and observational science. Do you have documents on climate

change? If so, what documents? In response to this question, 86.65% of the pupils said that they did not have any documents on climate change, compared to 13.35% who did. 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. Have you ever seen a map of flood-prone areas in Ouagadougou? All the pupils we interviewed said they had never seen a flood map of Ouagadougou. Whether flood risk maps exist at municipal level but remain inaccessible to schools, or are absent altogether, requires document analysis beyond the scope of this study. This gap represents a critical avenue for future research on risk communication infrastructure in Ouagadougou. .

We wanted to know whether pupils had received training on the impact of flooding. For the question asked, 97.38% of schoolchildren said they had not, compared with 2.62%. **Table 3** shows the proportion of responses to the questions.

| | Yes (%) | No (%) |
|---|---------|--------|
| Do you know any documents dealing with flooding or climate change? | 3.1 | 96.9 |
| Do you have documents on climate change? | 13.4 | 89.6 |
| Do you have any documents on environmental education? | 16.2 | 83.8 |
| Has a teacher ever shown you a map indicating the places in Ouagadougou where flooding can occur? | 0.0 | 100.0 |
| Did you receive any training on the impacts of flooding? | 2.6 | 97.4 |

Table 3: Questions related to pupils' awareness of flood manuals and books

The 3.12% who said they did know documents dealing with floods mentioned the following documents: a Geography book, textbook, text study, The Great Rain Nation, and observational science (**Fig 5**).

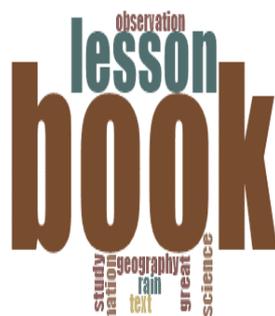


Figure 5: Documents dealing with floods (source: authors).

The 13.35% mentioned the following books: a geography book, a book on observational science, and a book on the climate of Burkina Faso (**Fig 6**).

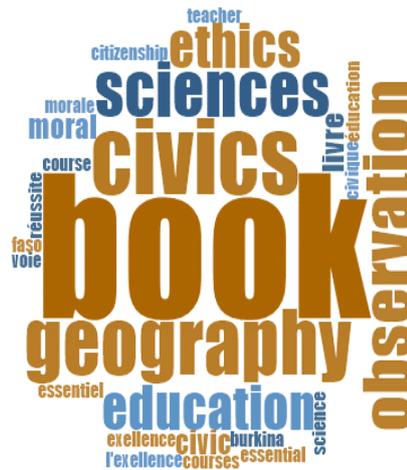


Figure 6: Document that talks about climate change (source: authors)

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 (Fig 7).

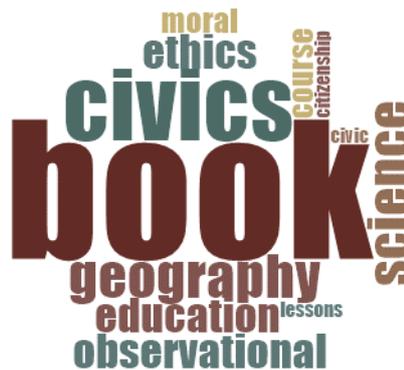


Figure 7: Document that talks about environmental education (source: authors)

The universal negative response to having seen a «flood risk map» likely reflects pupils' inability to recognise such documents rather than their physical absence. Direct observation of classroom walls and school offices would be required to assess actual map availability a methodological gap acknowledged.

3. Discussion

Flooding is a real problem caused by global warming in Africa. The number of children affected by natural disasters each year is alarmingly high and can be expected to rise as climate change continues (Dyregrov et al., 2018, p.2). The literature indicates that schools are suitable for risk communication and that adolescents should be involved and engaged in communication strategies (Midtbust et al., 2018, p.5). This study assessed pupils' knowledge and awareness of the effects of flooding in a primary school in the commune of Ouagadougou. The pupils' responses to the definition, causes, and effects of flooding showed that they were familiar with the issue of flooding but had not received any specific training. The study highlights the lack of formal education and training in disaster risk reduction and the importance of integrating these subjects into school curricula.

Although disaster education is often presented as an essential tool for raising awareness, Wisner (2004, p.11-14) and Lavell (2014, p.72) highlight its limitations. Education alone does not necessarily reduce vulnerability without structural measures, community initiatives and supportive policies. In Ouagadougou, local studies (Zongo et al 2021, IRSAT, 2020) emphasise that awareness-raising must be complemented by community action and public

policy in order to effectively mitigate flood risks. While Tempels (2016) documented a correlation between personal flood experience and risk awareness in Belgium, our study did not collect data on pupils' direct exposure (e.g., household flooding history). Therefore, we cannot confirm whether the observed knowledge stems from lived experience or other sources (media, family discussions). This limitation precludes direct comparison with Tempel's findings. Flood education is not part of the primary school curriculum in Burkina Faso, and this is also reflected in the studies (Goosse, 2020) that flooding is not explicitly the main subject of the Flemish curriculum. Most pupils know the risk of flooding (Ponstingel et al., 2019). A study assesses children's awareness of and preparedness for potential flood risks in Zagreb, Croatia. Stratified analysis by gender revealed no significant difference in flood definition accuracy (boys: 94.3% vs. girls: 94.8%; $\chi^2=0.04$, $p=0.84$) but a modest gap in preparedness knowledge (girls more likely to identify school location as flood-prone: 21.1% vs. 15.5%; $\chi^2=2.87$, $p=0.09$). This contrasts with Kimura et al. (2014) in Zagreb and suggests context-specific gender dynamics in flood risk perception. Children's flood risk perceptions, including their awareness and behaviours, can be cultivated through disaster education, which is crucial for improving disaster resilience and adaptation to climate extremes (Zhong et al., 2021, p.3).

A study examining the effects of a disaster education intervention on children's perception of risk and preparedness was carried out by (Yildiz et al., 2024) indicates that the disaster education intervention had a positive effect on children's perception of risk and the importance they attach to preparedness in the two sites studied. It helps children understand the risks and dangers in their living environment. From this, pupils 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. Education is key to preventing these hazards (Morote & Olcina, 2024, p.4). For (Morote et al., 2021, p.8), one point to consider is the transcendental role that education can play in reducing flood risk, which is contemplated as a factor that contributes to increasing resilience and reducing the vulnerability of society. However, according to (Rahman et al., 2014, p.6), the quality of the schools, as well as the level, speciality, and merit of the students, had an impact on the values of the climate awareness index. In addition, the study concluded that religion, gender, parents' education, profession and income could affect students' information about climate change in Bangladesh.

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 mitigating natural hazards. While the results reveal gaps in children's understanding of the impact of floods, they also highlight opportunities for improvement. Surveys have shown that pupils have empirical knowledge about flooding when asked if they knew the definition. The high percentage of «correct» definitions (94.5%) masks significant fragility: field notes indicate 68% of pupils required interviewer prompting or reformulation to produce a complete answer. This suggests that knowledge is context-dependent and unstable a nuance lost in binary scoring. Therefore, children remain vulnerable to this phenomenon. More than 90% do not know whether their school is located in a flood zone, and more than 80% say they have never been made aware of or educated about the impacts of flooding, environmental education or the risks of natural climate disasters.

Future studies should adopt ordinal scales capturing response fluency (e.g., spontaneous vs. prompted vs. incorrect). The same applies to the causes and impacts of flooding. While age-appropriate flood education is necessary, it is insufficient without structural interventions: (1) moratorium on new school construction in high-risk zones (e.g., Nakambé riverbanks); (2)

mandatory flood risk mapping for all public infrastructure projects; (3) community-led early warning systems co-designed with pupils. Education must complement not substitute for regulatory action by municipal authorities. It will also help to create a younger generation that is more aware and better prepared for the challenges posed by natural disasters, such as the frequent floods in our Sahelian countries. Given Burkina Faso's constraints (teacher shortages, lack of teaching materials), we propose a phased approach: Phase 1 (2026): Train 2 «disaster risk focal teachers» per district using low-cost pictorial guides; Phase 2 (2027): Integrate 3 flood-risk modules into existing geography/observation science curricula; Phase 3 (2028): Scale up to district-wide simulation drills contingent on infrastructure rehabilitation funding. The aim is to ensure that young schoolchildren are better equipped to deal with the challenges posed by floods and other natural climate disasters.

Acknowledgements

The German Federal Ministry of Education and Research (BMBF), through the West African Scientific Service Centre on Climate Change and Adapted Land Use (WASCAL), and the University of The Gambia, through its Department of Agriculture and Environmental Sciences, hosted us for our PhD training.

Conflicts of interest

The authors of this article declare that they have no known competing financial interests or personal relationships that could have appeared to influence this paper. So no conflicts of interest.

Data availability statement

The data cannot be publicly available; readers should contact the corresponding author for further details.

Bibliography

- 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>, Consulté le 08/05/2023
- Chindji, M. (2023). *Les inondations dans les bas-fonds de la commune de yaoundé 6 (centre-cameroun) : état des lieux et perspectives*. 6(October). <https://revues.imist.ma/index.php/EGSM/article/download/37958/19583>, Consulté le 09/05/2024
- Dyregrov, A., Yule, W., & Olf, M. (2018). *Children and natural disasters*. *European Journal of Psychotraumatology*, 9(sup2). <https://doi.org/10.1080/20008198.2018.1500823>, Consulté le 21/02/2025
- Goosse, T. (2020). Report 5. A : *Increase flood awareness through a school program*.
- Guilyardi, E., Lescarmontier, 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, https://projectenportfolio.nl/images/0/09/Report_5.A_School_program.pdf, Consulté le 12/07/2024
- 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, <https://orbi.uliege.be/handle/2268/197339>, Consulté le 15/07/2023
- Justine, S. (2017). *Impact de l'inondation sur le système éducatif: cas du fokontany ampefiloha ambodirano présenté par: 2017*, <https://www.clicours.com/impact-de-linondation-sur-le-systeme-educatif/>, Consulté le 05/08/2023
- 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, <https://www.scribd.com/document/458346880/6-0011-14-pdf?>, Consulté le 08/05/2023

- Kimura, N., Yamashiki, Y., & Kisić, I. (2014). *Awareness-raising of flood risk and building resilience among children in Zagreb, Croatia*. *Hydrological Research Letters*, 8(1), 64–70. <https://doi.org/10.3178/hrl.8.64>, Consulté le 21/02/2025
- 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>, Consulté le 01/11/2023
- Midtbust, L. G. H., Dyregrov, A., & Djup, H. W. (2018). *Communicating with children and adolescents about the risk of natural disasters*. *European Journal of Psychotraumatology*, 9(sup2). <https://doi.org/10.1080/20008198.2018.1429771>, Consulté le 01/11/2023
- Morote, Á. F., Hernández, M., & Olcina, J. (2021). *Are future school teachers qualified to teach flood risk? An approach from the geography discipline in the context of climate change*. *Sustainability (Switzerland)*, 13(15). <https://doi.org/10.3390/su13158560>, Consulté le 21/02/2025
- Morote, Á. F., & Olcina, J. (2024). *Preventing through Sustainability Education: Training and the Perception of Floods among School Children*. *Sustainability (Switzerland)*, 16(11), 1–15. <https://doi.org/10.3390/su16114678>, Consulté le 21/02/2025
- 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>, Consulté le 12/07/2024
- 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>, Consulté le 09/05/2024
- Rahman, S. M. A., Tasmin, S., Uddin, M. K., Islam, M. T., & Sujauddin, M. (2014). *Climate Change Awareness among the High School Students: Case Study from a Climate Vulnerable Country*. *International Journal of Built Environment and Sustainability*, 1(1), 18–26. <https://doi.org/10.11113/ijbes.v1.n1.4>, Consulté le 12/05/2024
- RGBF. (2010). *Inondations du 1^{er} Septembre 2009 au Burkina Faso* (Issue 56803), <https://documents1.worldbank.org/curated/en/279691468228286575/pdf/568030v10FRENC1ept0090Rapport0Final.pdf>, Consulté le 08/05/2023
- 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, <https://www.inplanning.eu/wp-content/uploads/phd-pdf-flood-resilience-a-co-evolutionary-approach.pdf>, Consulté le 09/05/2024
- UNICEF. (2022). *Analyse des risques et de l'impact des aléas sur les enfants*, [https://www.unicef.org/guinea/media/8726/file/Analyse%20des%20risques%20et%20de%20l%27impact%20des%20al%C3%A9as%20sur%20les%20enfants%20\(CRI-A\).pdf](https://www.unicef.org/guinea/media/8726/file/Analyse%20des%20risques%20et%20de%20l%27impact%20des%20al%C3%A9as%20sur%20les%20enfants%20(CRI-A).pdf), Consulté le 01/11/2023
- Usmaningtyas Ayu Dwi Septiningrum, Y. A. W., Puspita, and R., & Dewi. (2022). *An Analysis of Elementary School Vulnerability* in. 662(Icolae 2021), 991–1001, <https://www.atlantis-press.com/article/125974309.pdf>, Consulté le 08/05/2023
- Yildiz, A., Dickinson, J., Priego-Hernández, J., Teeuw, R., & Shaw, R. (2024). *Effects of disaster education on children's risk perception and preparedness: A quasi-experimental longitudinal study*. *Geographical Journal*, 190(2), 1–19. <https://doi.org/10.1111/geoj.12556>, Consulté le 21/20/2025
- Zhong, S., Cheng, Q., Zhang, S., Huang, C., & Wang, Z. (2021). *An impact assessment of disaster education on children's flood risk perceptions in China: Policy implications for*

Halidou KAFANDO, Vincent Nduka OJEH, Blaise OUEDRAOGO, Adama Boua DOUMBIA, Gustavo J. NAGY & Mihaela SIMA – Décalage entre connaissances empiriques et éducation formelle face aux inondations : une étude transversale auprès d'élèves du primaire à Ouagadougou (Burkina Faso)

adaptation to climate extremes. Science of the Total Environment, 757, 143761.
<https://doi.org/10.1016/j.scitotenv.2020.14376>, Consulté le 21/20/2025