

Teaching and Learning in Fragile Contexts (TLFC) Research Paper



Interrogating Teaching and Learning Practices in Flood-affected Basic Schools in the Volta Region of Ghana

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Plain Language Summary

Teaching and Learning in Flood Affected Schools in Ghana

This study looked at how repeated flooding affects teaching and learning in basic schools in four districts in Ghana's Volta Region. These areas are flooded almost every year. In 2023, floods forced more than 32,000 students and over 1,200 teachers out of their schools and made 90 schools unsafe or impossible to use. This goes against Ghana's commitment to providing safe and accessible education for all children.

The study asked how flooding affects learning, school leadership, gender equality, inclusion of learners with disabilities, and the quality of teaching—especially reading, writing, and maths. It also looked at what policies exist and what more could be done to protect education during floods. Researchers collected survey data and interviews from school leaders, teachers, learners, education officials, and community members in early 2025.

What the study found

Flooding seriously disrupted education. Many teachers missed weeks of teaching, and student attendance dropped sharply during floods. Although attendance improved after the floods, learning losses remained. Reading, writing, and numeracy skills declined because books were destroyed, classrooms were overcrowded or poorly lit, lessons were interrupted, and many children struggled to concentrate due to stress and displacement. Schools also lacked appropriate learning materials.

Flooding widened gender and inclusion gaps. Girls were more likely than boys to stop attending school, especially during menstruation, because crossing floodwaters was unsafe and sanitary pads were unaffordable. Learners with disabilities faced major barriers, including lack of transport and inaccessible temporary learning spaces. While inclusion improved after the floods, some classrooms remained non-inclusive.

School leaders were under severe strain. Most felt unable to manage school operations, stress, or workloads during the floods. Schools had to improvise learning spaces, replace destroyed materials, support traumatised students and staff, and cope with classrooms being used as emergency shelters. Community support helped but was inconsistent, as families were dealing with their own losses.

Although some emergency and inclusive education policies exist, they were poorly implemented. Responses depended heavily on NGOs and were not well planned or funded. Gender-responsive and inclusive measures were especially weak during emergencies. Health and safety measures, such as evacuation training, were rarely put into practice due to lack of funding.

What this means

Education systems in flood-prone areas need better planning and coordination. Emergency responses should not be ad hoc. Schools need stable, safe learning spaces, learning materials that can survive floods, and teaching approaches that support children affected by trauma. Policies for inclusion and gender equality must be backed by clear procedures, funding, and trained staff. School leaders need support and training to manage crises, and community help cannot replace government responsibility.

Key recommendations

The study recommends that government and education authorities:

- Build schools on higher ground using flood-resistant designs.
- Protect books and learning materials with disaster-proof storage.
- Provide dedicated funding and clear emergency plans at district level.
- Build permanent community shelters so schools are not used for housing during floods.
- Train teachers and school leaders in disaster management and emergency response.
- Strengthen support for learners with disabilities, including accessible transport.
- Support girls with sanitary pads, financial assistance, and measures to prevent dropout.
- Improve drainage, bridges, and flood-control infrastructure.
- Teach survival skills such as swimming and evacuation preparedness in flood-prone areas.

Together, these steps can help ensure that children's education continues safely and fairly, even during disasters.

EXECUTIVE SUMMARY

The teaching and learning in fragile contexts (TLFCs) study examined the impact of perennial floods on teaching and learning in basic schools across four severely affected districts in the Volta Region of Ghana (i.e., North Tongu, Keta, Central Tongu, and Keta South). The 2023 floods displaced 32,379 learners and 1,288 teachers, rendering 90 schools inaccessible or unsafe, directly contravening Ghana's Education Act 778 commitment to accessible, quality education in safe environments.

The study was designed to answer four main research questions:

1. How have the perennial floods affected teaching and learning, school leadership, and community members' support for learning?
2. What are the perceived impacts of the floods on learners' access to schools in terms of gender and inclusion?
3. In what ways have flood-related challenges influenced the quality of teaching and learning in relation to (a) foundational literacy, and (b) utilisation of age-appropriate teaching and learning materials?
4. What policy measures are in place or could be instituted to (a) make education accessible and inclusive, (b) gender-responsive, and (c) to improve the health and safety of teachers and learners, and the quality of teaching and learning?

Using a convergent mixed methods design, the research gathered quantitative data from 52 school heads and 247 teachers, alongside qualitative data from 340 learners, three district education directors, and four school management committee members through structured questionnaires, focus group discussions, and interviews conducted between April and May 2025.

Key findings

- There were severe disruptions across all aspects of education delivery in the affected schools. Nearly 38.46% of teachers missed between 2 to 4 weeks of teaching. Learner participation in class dropped from 93.1% before the floods to 9.3% during the disaster, with partial recovery to 82.4% afterwards. Student attendance declined, with 57.7% of school heads reporting decreases, and teacher attendance was similarly affected, as 42.3% of school heads noted significant reductions. Beyond physical disruptions, the floods critically compromised teaching quality and learning outcomes. Foundational literacy deteriorated, with 53.8% of school heads reporting large-scale impacts on reading and writing, and 48.1% on numeracy. Teachers' responses showed similar patterns, with 50.2% reporting major impact on reading and writing, and 49.8% on numeracy. Additionally, 50.0% of school heads and 53.0% of teachers reported that the use of age-appropriate textbooks and materials was affected to a large extent. Qualitative findings identified four interconnected factors undermining literacy: the destruction of books, poor lighting in temporary

classrooms, overcrowding and disrupted continuity, and the psychological toll of displacement that hindered learners' concentration.

- Gender and inclusion disparities widened during and after the flooding. About 25% of school heads observed sharper decreases in girls' participation compared to boys. Female learners cited menstrual dignity as a critical barrier, with some explaining how crossing waist-deep floodwaters during menstruation discouraged attendance entirely. Support for learners with disabilities proved inadequate: only 31% of school heads believed their schools were adequately supportive, while 34.6% indicated inadequate support and 34.6% were uncertain. Classroom inclusivity collapsed from 89.5% before the floods to 30.4% during the disaster, with recovery to 82.6% following the floods, yet 11.7% of teachers still reported non-inclusive classrooms. Geographical isolation and socio-economic vulnerability compounded access barriers, particularly for girls from households unable to afford sanitary pads and facing greater risk of teenage pregnancy and dropout.
- School leadership was deeply strained by the floods with participants rating their effectiveness as follows: Only 7.7% of heads rated themselves as effective in managing operations during the floods while 59.6% felt they were ineffective. Similarly, 61.5% described themselves as ineffective in managing stress and workload. School heads faced logistical challenges, including coordinating improvised learning settings, replacing destroyed materials, managing traumatised staff and learners, and implementing alternative timetables whilst classrooms served as emergency shelters. Community support, although valuable, became sporadic as families dealt with their own displacement and losses. Volunteer-led informal learning under trees became the only educational option in some areas.

Regarding policy measures for accessible, inclusive and gender-responsive education:

- UNICEF organised training for District-level Education in Emergency Response teams to plan ahead for disasters, including relocating schools from lowlands to higher ground. However, implementation faced critical funding constraints.
- Although inclusive education policies at the national level prohibit discrimination and mandate provisions for the needs of children with disabilities, during the flood disasters practical challenges remained, including transport breakdowns.
- Policy implementation was ad hoc; it relied mainly on NGO support for items such as uniforms and sanitary pads and lacked systematic procedures and pre-positioned supplies.
- Gender-responsive policies have led to some parity, but acute pressures on girls in flood-affected households, including lack of access to sanitary pads and increased risk of teenage pregnancy and dropout remained unresolved.
- Recommended measures related to health and safety, such as tree pruning and swimming or evacuation training exist but are not codified or regularly implemented, primarily due to the absence of dedicated contingency funding.

Based on these findings we draw the following conclusions:

- Education systems in the disaster-prone districts cannot survive with fragmented emergency responses. They require institutionalised, coordinated planning across agencies instead of operating in silos.
- It is imperative to sustain foundational literacy during disasters through the consistent provision of age-appropriate materials, safe learning environments, stability, and trauma-informed pedagogies.
- Inclusive education policies must go beyond formal statements and enact standardised emergency protocols, pre-positioned accessible transport, and skilled personnel for learners with disabilities.
- Gender-responsive interventions do not adequately address the socio-economic vulnerabilities, especially for girls, and must be intensified during emergencies to maintain dignity and reduce dropout.
- School leadership in flood-affected contexts requires capacity development and provision of resources for crisis response, psychosocial support, and adaptive problem-solving.
- Finally, community engagement and other forms of support are vital, but cannot replace the responsibility of government to provide planned and systematic support for education in crisis situations.

Key recommendations

We offer the following recommendations for consideration by the Government, educational authority and education stakeholder communities, especially those in flood-prone areas:

1. Ghana's Ministry of Education and its responsible agencies should ensure that schools in flood-prone areas are sited on higher grounds using disaster-resistant designs and materials for swift recovery after flooding.
2. Disaster-proof student cabinets should be provided by the Government to safeguard learning materials.
3. The Government of Ghana must ensure that there are dedicated district-level financing and clear operating procedures for flood emergencies, with pre-positioned supplies, accessible transport for learners with disabilities, and protocols for relocating classrooms.
4. Permanent community shelters for disaster victims should be constructed by Government in flood-affected areas to avert schools from becoming their emergency accommodation.
5. Ghana Education Service must ensure that teachers receive training in disaster management, and each school must integrate it into their professional learning development activities. District should also establish a disaster management unit responsible for educational emergencies, drills, and counselling.
6. Inclusive education policies need to be strengthened through periodic and consistent monitoring and evaluation. Thus, the Government must provide dedicated personnel, and ensure standard provisions for learners with disabilities, including standby evacuation vehicles.

7. Gender-responsive measures must be instituted by Government through the Ministries of Education and Gender and Social Protection to reduce household shocks for girls by providing sanitary pads, scholarships, and targeted financial support to prevent dropout.
8. The Government (through the metropolitan, municipal and district assemblies) must undertake required infrastructure improvements, including constructing proper drainage systems, periodic desilting of gutters and waterways, and bridge construction in flood-prone areas to help alleviate the plight of affected communities and schools.
9. Finally, local educational authorities, with the support of Government and development partners, must include survival skills like swimming and evacuation in ongoing professional development of teachers, especially in flood-prone areas to foster readiness and resilience.

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INTRODUCTION

Background and Context

In September 2015, nations the world over adopted a new vision to guide their continuous efforts to build a better world for all. Within this vision, a collective agenda that enjoins nations to formulate and implement educational policies that enable all children to access equitable, quality education is enshrined (United Nations, 2015). This implies educational policies are to emphasise respect for equity, inclusion, diversity, and ensure equal opportunities for all children to learn to know, to be, to do, and to live with others (Delors et al., 1996). Providing accessible quality education also means that children, including those living with disabilities (for example, visually impaired and autistic), must benefit from mainstream schools and enjoy child-centred pedagogies and learning (Ohba & Malenya, 2022). Research has shown that children are born with a deep drive for knowledge and that they bring this innate trait with them to school to explore their world and become more skilled, and develop mentally and socially to build their self-confidence (Swaffield & MacBeath, 2009). Thus, they thrive when learning environments are safe and provide choices and purposefulness (MacBeath et al., 2018).

Despite significant improvements in educational access across the world, access to education remains a challenge in Sub-Saharan Africa, and even more so, quality teaching and learning because of disasters such as wars and climate change (Kabay, 2021; Miningou et al., 2022; World Bank, 2019). Although, the issue of poor quality teaching and learning is a global concern (Azevedo et al., 2021); yet, this is more endemic in Sub-Saharan Africa, where 87% of children in school are categorised as 'learning poor' (Crouch et al., 2021). This poor learning is typified by the inability of learners at age 10 to read and understand a simple comprehension passage that is legible, comprehensible, or appropriate to their age. This, thus, makes schooling without learning not just a misused development chance but also grave injustice to learners, especially if what causes the poor learning are human-induced disasters. Without effective teaching and learning, education fails to deliver on its promise to eradicate extreme poverty and generate shared opportunity and affluence for all (World Bank, 2019). Thus, the high rates of learning poverty in Sub-Saharan Africa can degenerate into a human capital catastrophe because of having undermined the attainment of SDGs, especially the education goal.

We situate the study on which this report is based within the fragile teaching and learning contexts in Ghana. Ghana has been intentional about the provision of accessible, quality education to all children. Section 5 of the 2008 Education Act 778, for example, unequivocally asserts that all school-age children must have access to school and enjoy equitable quality teaching and learning in safe environments (Ministry of Education , 2015).

However, human-induced disasters, including perennial floods and ethnic conflicts, have made some parts of the country fragile, dangerous, unsafe, and unsuitable for effective teaching and learning. Schools in these fragile contexts are not only inaccessible and unsafe for teaching and learning, but families also lose their livelihoods and are displaced internally.

This research focuses on the educational challenges in the Volta Region of Ghana, marked by a vulnerable geography prone to climate change effects. The region faces recurrent floods due to heavy rains and dam spillage often necessitated by the opening of the Akosombo Dam by the Volta River Authorities when the high tides flow of water from the Black Volta in Burkina Faso potentially places the Volta Dam to be at risk of breaking its boundaries. This has often disrupted education by damaging infrastructure, displacing communities, and causing school closures in the Volta enclave. Specifically, the Lower Volta Basin has experienced severe impacts displacing families and rendering schools fragile and unsafe. For instance, 32,379 learners and 1,288 teachers were forced to vacate schools due to adverse weather conditions, underscoring the urgent need for investigation (Ghana Education Service, 2023; Graphic Online, 2023).

On the back of these intriguing statistics this study aimed to explore teaching and learning practices in affected schools, recognizing the Volta Region as a fragile context shaped by the immediate and significant impact of climate change on education delivery and provision. Table 1 shows the education statistics on schools affected by the floods in the Volta Region.

Table 1. Education Statistics on Schools Affected by Floods in the Volta Region

#	Municipal/ District	No. of Schools	No. of Learners	No. of Teachers
1	Keta	17	9,803	408
2	North Tongu	47	14,415	458
3	Anloga	2	465	15
4	South Tongu	6	999	195
5	Central Tongu	11	2,489	84
6	Ketu South	6	4,090	113
7	Kpando	1	118	15
	Total	90	32379	1288

Note. Source: Ghana Education Service, 2023

It is instructive to note that formal education in Ghana is provided both at pre-tertiary and tertiary levels. Our focus in the study on which this report is based was on interrogating

teaching and learning in flood-affected public basic schools (i.e., kindergarten, primary, and junior high schools (JHS) in the affected districts in the Region.

Aim of the Study

The study sought to examine the perceived impact of perennial floods on access and quality of education in basic schools in the Volta Region of Ghana.

Research Questions

The following research questions guided the study:

1. How have the perennial floods affected teaching and learning, school leadership, and community members' support for learning?
2. What are the perceived impacts of the floods on learners' access to schools in terms of gender and inclusion?
3. In what ways have flood-related challenges influenced the quality of teaching and learning in relation to (a) foundational literacy, and (b) utilisation of age-appropriate teaching and learning materials?

What policy measures are in place or could be instituted to (a) make education accessible and inclusive, (b) gender-responsive, and (c) to improve the health and safety of teachers and learners, and the quality of teaching and learning?

Definition of key terms, including access to education, quality education and gender can be found in appendix C.

Theory of Change

Table 2. Theory of Change Guiding the Study

Component	Description
Goal	Examine the perceived impact of perennial floods on access and quality of education in basic schools in the Volta Region of Ghana.
Inputs	Research Funding Stakeholder Engagement Research Team
Activities	Facilitate stakeholder engagement Administer questionnaire Conduct in-depth interviews Facilitate focus group discussions Analyse data and write report Validate and disseminate findings

Outputs	Comprehensive report on perceived impacts of floods on schooling and strategies for mitigating the effects of the floods Policy briefs for authorities Community workshops to share findings
Outcomes	Increased awareness on stakeholders' pro-teaching and learning initiatives in flood affected areas Better understanding of dynamics of schooling in flood affected areas and stakeholders strategies to sustaining teaching and learning Improved educational practices based on research insights
Long-Term Impact	Sustained access to quality education in flood-affected areas, leading to improved educational outcomes for learners and strengthened community resilience.

METHODOLOGY

Research design

The convergent mixed methods design (Creswell & Gutterman, 2019; Creswell & Plano Clark, 2007; Tashakkori & Teddlie, 2018; Vaughn & Jacquez, 2020; Yin, 2018) was deployed to gather quantitative and qualitative data to address the research questions. This design was used because of its multifaceted approach that recognizes the interconnected roles and perspectives which are essential for understanding the broader implications of natural disasters on education. So, although both datasets were gathered concurrently and analysed separately, we first presented the quantitative results and used the qualitative findings to elucidate and expand the quantitative findings about teaching and learning practices in the flood-affected schools in selected districts of the Volta Region. Figure 1 represents a summary of the research design.

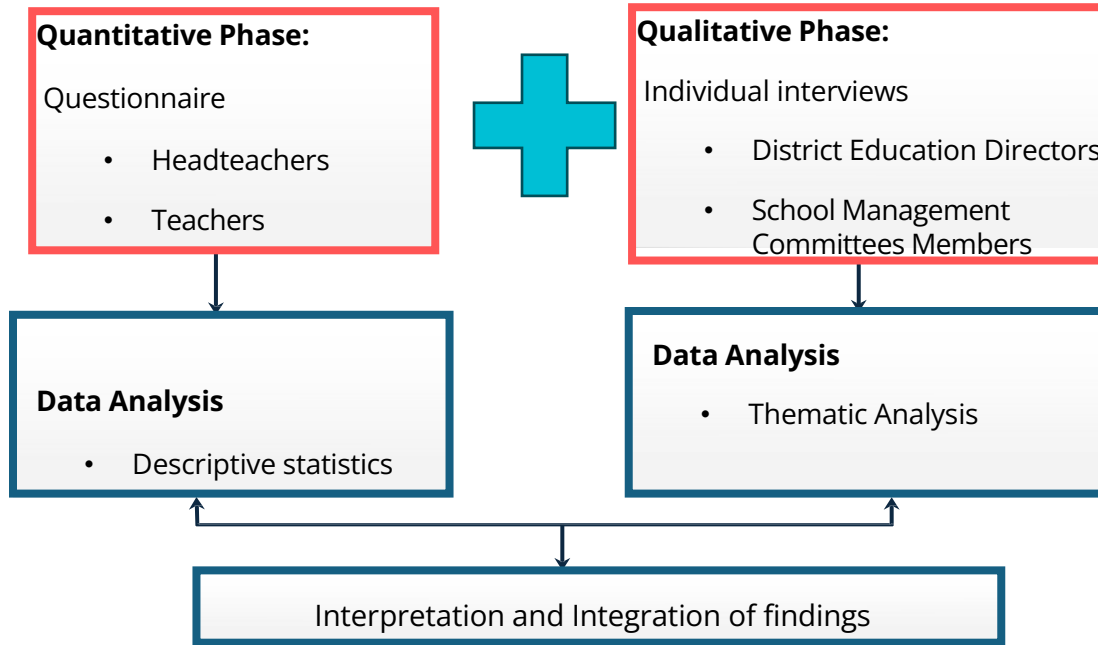


Figure 1. Convergent Mixed Methods Design for Fragile Context Study

Sampling Districts, Schools and Participants

This study employed a multistage sampling procedure to ensure the representation of diverse and relevant districts, schools and participant pool, thereby enabling a comprehensive analysis of the perceived impact of flooding on educational settings.

The first stage of the sampling procedure involved the selection of districts significantly impacted by the flooding. From an initial pool of seven flood-affected districts, a purposeful selection was made based on the severity of flooding experienced in each district (See Table 1 as reported by GES, 2023). The districts were ranked accordingly, and four of the most severely affected districts were chosen to provide typical case representation.

The target population comprised headteachers, teachers, learners aged 9 to 13 and key administrative stakeholders (school management committee – SMC members and district education directors –DED) from the flood-affected districts. This configuration facilitated a thorough exploration of the perceptions and experiences of research participants. The distribution of the sample is detailed in Table 3.

Table 3. Sample Distribution of Flood-Affected Districts, Schools and Participants

S/N	Districts	No. of Schools	Number of Participants					Total
			Head Teachers	Learners	Teachers	SMC Members	DED Officers	
1	North Tongu	25	25	200	145	1	1	372
2	Keta	11	11	65	48	1	0	125
3	Central Tongu	10	10	50	36	1	1	98
4	Ketu South	6	6	25	18	1	1	51
	Total	52	52	340	247	4	3	646

Note: SMC = School Management Committee; DED = District Education Directorate

The sample size for this study was established through a combination of power analysis and practical considerations, ensuring that the findings were both statistically significant and feasible within the constraints of the research framework. The choice of school and community level stakeholders was based on the critical role they play in achieving the moral purpose of the school. Table 4 clarifies the criteria for participant inclusion.

Table 4. Participants and Criteria for Inclusion

Participants	Inclusion Criteria
Headteachers	Their pivotal role as managers of the schools
Teachers	Their daily engagement with learners and the crucial role they play in modifying pedagogical strategies to support learning in schools, including flood-affected ones As role models and inspirers of learners to life-long love for learning and development
Learners	Their wellbeing and learning was directly affected by the floods
District Education Directors	Because of their oversight responsibilities over the schools in the district
SMC Members	Their role in providing a community-based nuances to the effects of the floods

Data Collection Tools

Structured questionnaires, interview guides, focused group guides, and observation checklists were used to collect data for the study. These tools were designed to capture information about experiences, attendance, teaching, learning, literacy attainment, and challenges related to the flood situation. They were validated by members of the research

team, accomplished independent researchers and pilot testing before they were administered. The guides can be found in Appendix A.

Data Collection Procedures

Prior to data collection, the research team obtained permission from the Ghana Education Service (GES) that enabled us to access the selected schools. Structured questionnaires were administered to school heads and teachers to gather quantitative data on instructional challenges, resource availability, and adaptive strategies in flood-prone schools. To capture the perspectives of pupils, trained enumerators conducted focus group discussions with Grades 4 and 8 learners, using semi-structured guides to explore their learning experiences, coping mechanisms, and engagement in school activities during and after flooding events. Additionally, three district education officers were interviewed to provide policy-level insights into disaster-responsive educational planning and support systems. The data collection process was meticulously planned to minimize disruption to school activities, and participants were assured of confidentiality and voluntary participation.

Data Management and Quality Assurance

To ensure the integrity and reliability of the data, rigorous data management and quality assurance measures were implemented throughout the research process. All questionnaire responses were reviewed for completeness and consistency before data entry, and any ambiguities were clarified with respondents where necessary. Audio recordings from FGDs and interviews were transcribed verbatim and cross-checked by multiple researchers to enhance accuracy. Data from different sources were systematically coded and categorized to facilitate thematic analysis while maintaining the contextual richness of qualitative responses. A secure, password-protected digital repository was used to store all datasets, ensuring compliance with ethical data protection standards. Additionally, inter-coder reliability checks were conducted among research team members to enhance the validity of qualitative interpretations. These measures collectively ensured that the findings of the study were both credible, trustworthy and reflective of the lived experiences of educators and learners in flood-affected schools.

Data Analysis

Regarding qualitative data analysis, the team employed coding, categorisation, thematic, and narrative analysis techniques, whilst using direct quotes from interview and focus group discussion transcripts clearly express the participants' experiences. For the quantitative data analysis, the team used statistical software to generate descriptive

statistics such as frequencies and percentages. The team created visual representations of the data (e.g., charts, graphs, and diagrams) to enhance understanding and communication of key findings.

Ethical Clearance

For the study, all relevant ethical standards and procedures, such as seeking permission from institutional ethics review board, informed consent, data privacy, safeguarding the anonymity, and confidentiality of participants, were adhered to. For example, the research team submitted the research proposal and design to the University of Cape Coast Institutional Review Board and the Institute for Educational Planning and Administration Ethics Committee for review and approval before conducting the research. Additionally, before data collection, the research team obtained informed consent from research participants, including teachers, headteachers, and learners. As gatekeepers of the school, the headteachers also granted consent for us to speak to the learners.

FINDINGS

This section presents and interprets the findings of the study regarding education delivery in flood-affected basic schools. For purposes of clarity and succinctness of presentation, the findings are presented according to the research questions. The quantitative results are presented first and then followed by the qualitative insights. Before then, we present the demographic characteristics of the research participants to provide socio-environmental context and/or background to the study.

Demographic Characteristics of Participants

The demographic characteristics encompass gender of participants and frequency and severity of exposure to flooding.

Gender Distribution

The analysis indicates a significant gender imbalance in educational leadership as shown in Figure 2.

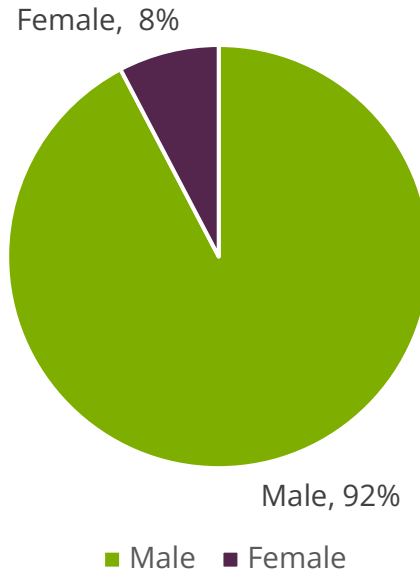


Figure 2. Gender of School Heads

Of all the participants, 92% (n = 48) were male and only 8% (n = 4) were female, highlighting longstanding disparities in leadership roles within basic education, particularly in rural settings. Furthermore, while the teaching workforce was somewhat more balanced – 63% male (n = 156) and 37% female (n = 91) (See Figure 3) the underrepresentation of female teachers remains a critical concern given their vital role as role models for female learners.

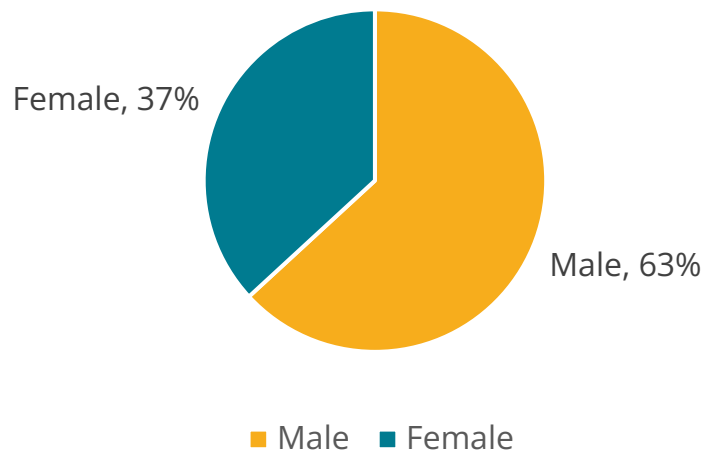


Figure 3. Gender of Teachers

Frequency and Severity of Floods

The study also considered the extent to which the research participants had been exposed to flooding within their school contexts. Data were collected on the frequency and severity of flooding over time to better understand the depth and continuity of exposure among respondents.

As illustrated in Figure 4, more than half of the school heads (55.77%, n = 29) indicated that their schools experience flooding annually, while 34.62% (n = 18) reported flood events occurring once every three years or more. Smaller proportions experienced flooding every two years (7.69%, n = 4) or every three years (1.92%, n = 1).

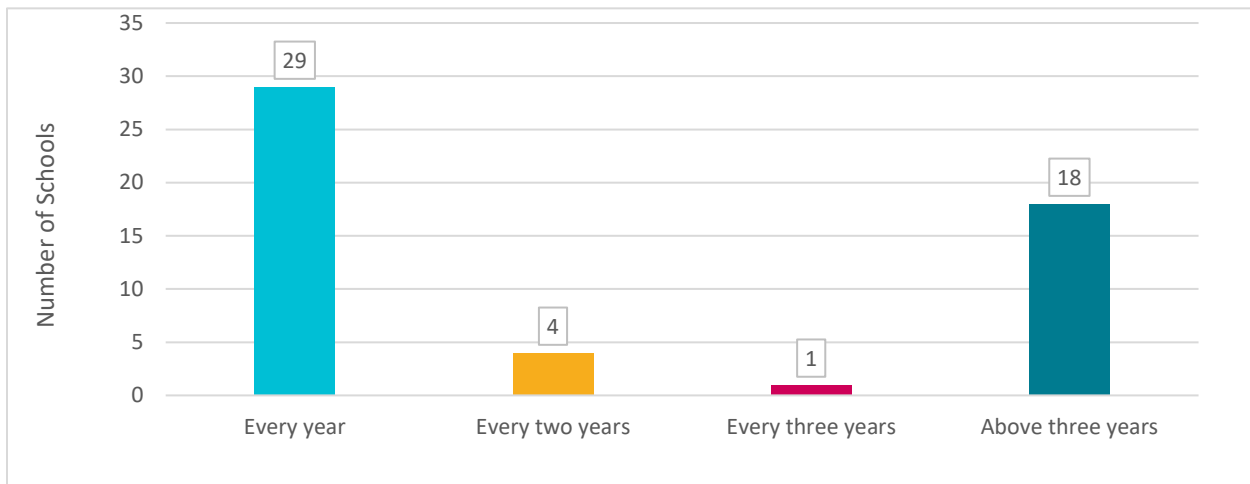


Figure 4. Frequency of Floods in the Schools

Figure 4 reveals that 55.77% (n = 29) of school heads indicated that their schools experienced annual flooding. Regarding the severity of flooding experienced by the participating schools, 67.31% (n = 35) respondents described it as very severe (Figure 5). This consistent exposure underscores the urgency of addressing educational vulnerabilities in flood-prone regions.

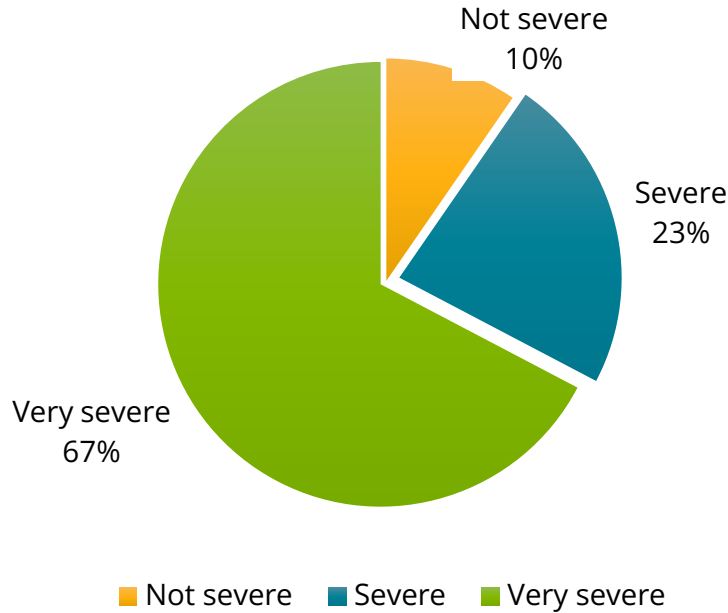


Figure 5. Severity of the 2023 Floods

These characteristics offer a strong justification for the selection of respondents and participants as credible sources of in-depth, context-specific insights needed to address the study's research questions.

Research Question 1

How have the perennial floods affected teaching and learning, school leadership, and community members' support?

This section examines the effects of recurring floods on three interrelated domains critical to the functioning of basic education: teaching and learning, school leadership, and community engagement. Drawing on data from school heads, teachers, learners, community stakeholders, and district education officers, the findings shed light on the varied ways in which flooding has disrupted instructional delivery, hindered learner participation, and strained the operational capacity of school leaders during and after the floods.

Teaching and Learning

The most immediate effect of the recurrent floods was on teaching and learning activities. Teachers reported substantial disruptions, with nearly 38.46% (n = 95) indicating they missed between 2 to 4 weeks of teaching, and 37.25% (n = 92) reporting even greater interruptions (Figure 6).

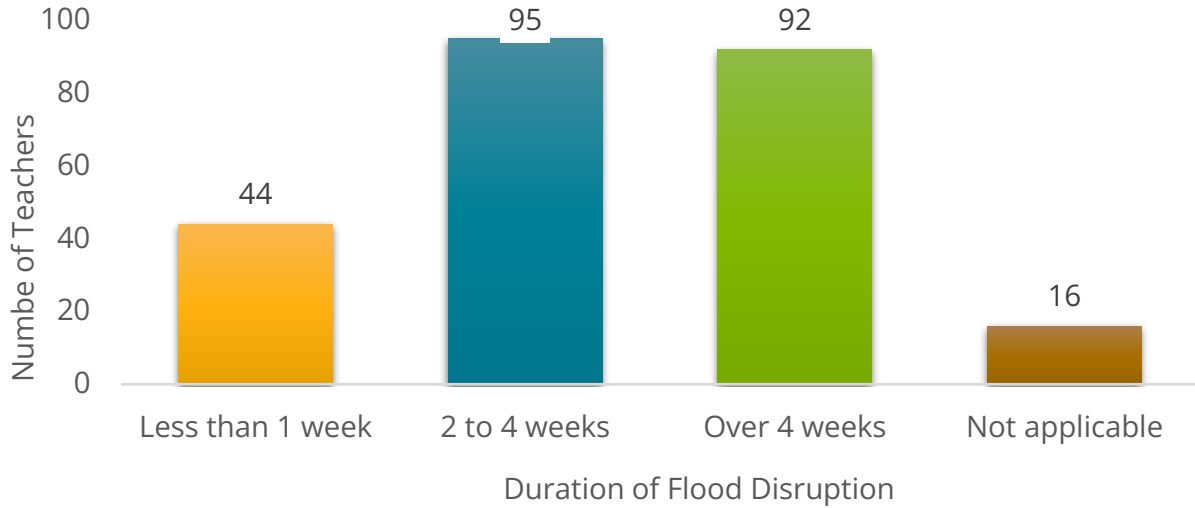
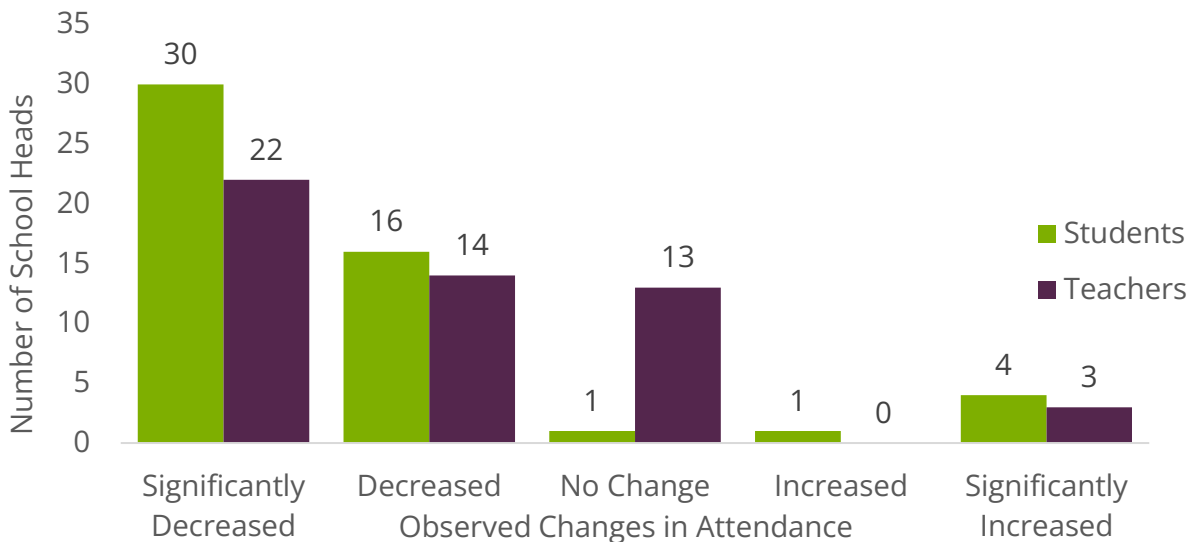


Figure 6. Duration of Disruption of Teaching and Learning Activities

These findings point to the acute vulnerability of teaching and learning in flood-prone areas in the Volta Region. The extensive loss of instructional time compromises curriculum coverage, delayed assessments, and learner progression, and exacerbated existing educational inequities. For pupils with limited academic support outside school, particularly those already struggling, these interruptions risk entrenching learning deficits and disengagement.

Moreover, attendance patterns revealed significant declines, with 57.7% (n = 30) of school heads reporting substantial decreases in student attendance during the floods (Figure 7).



This decline not only disrupted continuity of education but also undermined the stability necessary for effective teaching and learning.

Figure 7. Changes in Attendance of Students and Teachers During the 2023 Floods

Teacher attendance was also affected, where, 42.3% of school heads (n = 22) reported a significant decrease in teacher attendance, and 26.9% (n = 14) observed a decrease. In contrast, 25% (n = 13) noted no change, while 5.8% (n = 3) and 5.8% (n = 3) reported an increase or significant increase, respectively.

These reported disruptions in attendance have significant implications for teaching and learning. High levels of learner absenteeism may result in erratic class sizes, making it challenging for teachers to maintain instructional consistency and momentum. In such contexts, teachers are often compelled to revise or repeat lessons for returning learners, which invariably delays curriculum coverage and diminishes overall instructional efficiency. Similarly, reduced teacher attendance, contributed to fragmented lesson delivery and a general slowing of academic activities within the affected schools. These patterns reflect well-established evidence of how attendance instability undermines educational quality, particularly in fragile, disaster-prone, and resource-constrained environments (World Bank, 2019; Crouch et al., 2021). In such contexts, learning disruptions risk deepening existing learning poverty and hindering progress towards inclusive, quality education as envisioned in Sustainable Development Goal 4 (United Nations, 2015).

Teachers also rated the effectiveness of learner participation before, during, and after the 2023 floods (See Figure 8).

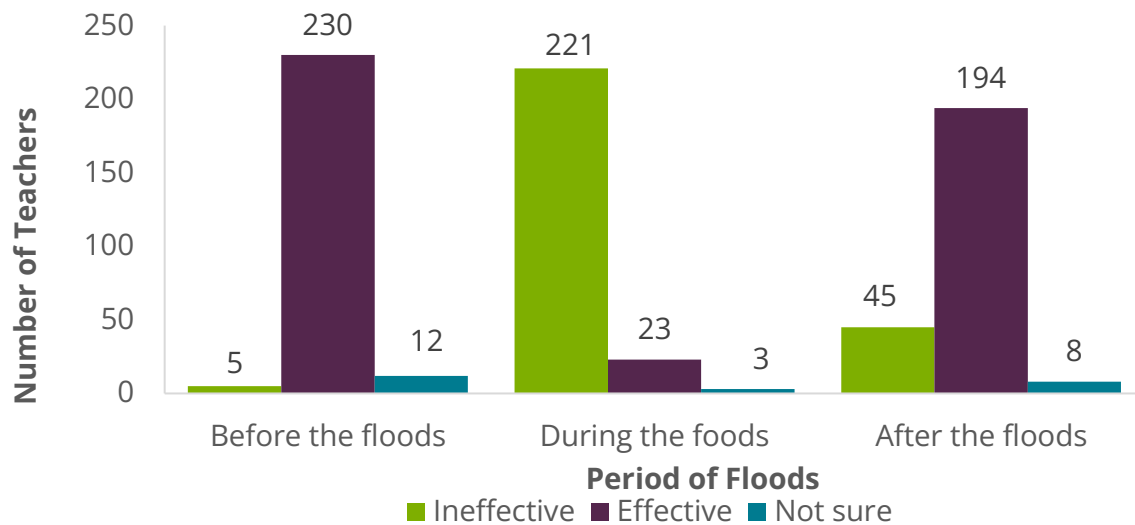


Figure 8. Teachers' Perceptions of the Effectiveness of Learners' Participation in Class

Figure 8 shows that while 93.1% of teachers noted effective learner participation before the floods, this figure plummeted to 9.3% during the disaster. The subsequent recovery post-flood was inadequate, with 18.2% still noting ineffective participation thereafter. Such patterns highlight the long-lasting implications of environmental disruptions on educational dynamics. The quantitative findings suggest that the floods significantly disrupted the conditions necessary for effective classroom engagement. Even when schools remained open or resumed operations, learners' ability to attend and actively participate in class during and after the floods were affected.

The qualitative findings from the analysis of the learner focused group discussions (FGDs) and key informant interviews substantiated these findings. Learners' experiences, as shared during the FGDs, revealed deeply individual and common ways through which the floods disrupted teaching and learning. Several learners explained that the loss of physical school spaces and the need to walk long distances to improvised venues to learn severely affected their ability to attend classes on time and participate meaningfully. For instance, in one FGD, it was commonly expressed that:

During the times of the flood, we couldn't go to school early as we used to... It is not even our own classroom, it's a church building... by the time we walk from here to that place, greater part of the lesson is already taught in our absence. (FGD1).

Physical exhaustion and emotional fatigue were barriers to learning, with some students describing how their capacity to engage in lessons was undermined by hunger, sleeplessness, or distress caused by the floods. As a discussant of FGD1 explained, *The flood has made it difficult to go to class early... When the teacher asks a question, you are even emotionally tired, so you won't be able to answer.* Members of FGD15 corroborated this statement with one of them saying, *When we come to class, we just concentrate on our rotten and cracked feet. So, when teaching is ongoing, we are not able to concentrate and participate.* Because the floods ravaged farms, the discussants resonated with one another that during the flood, they struggled to get food and so they were before, during and after school hours, their minds were pre-occupied by how to get food to eat (FGD18). These experiences highlight the interconnectedness of learning, wellbeing, and the broader socio-economic environment, particularly in vulnerable communities where education is closely tied to household stability.

Moreover, the destruction of learning materials, infrastructure, and home environments further limited learners' ability to continue their studies even outside the classroom. This is because,

Our books and our desks got destroyed... Our compound got destroyed and heaped with a lot of rubbish... school and teaching and learning has never been like before. This was

worsened by the irregular attendance of teachers to school due to the floods (Discussants of FGD3 and FGD12). Learning just stopped. Because we were not coming to school... we couldn't even write. Like the KGs... those who are coming from very far places could not make it (A discussant of FGD14).

As overseers of education delivery in the districts, the District Directors of Education's views corroborated those of the learners regarding teaching and learners:

The major impact of the floods had to do with the temporary stoppage of education delivery in the municipality. Students could not access roads leading to their schools, and teachers also couldn't reach their schools. In areas where the access routes were okay, the schools themselves were flooded. So even if they got to the school, they couldn't enter the classrooms ... there was no teaching and learning. Moreover, many educational materials like textbooks, exercise books, and others got soaked. Some students who had left their bags in the classrooms couldn't retrieve them because the flood destroyed everything (DDE1).

This situation had structural, psychological, and economic implications because as DDE1 posited:

... In some cases even floods reached the window level. Technically, once things [school buildings]are soaked in a flood, the structural integrity is compromised. Also, some students were unable to complete the schemes of learning prepared by their teachers. After the flood, they had to start all over again, which caused delays compared to other districts. Since their materials were destroyed, they also needed money to replace them. Both teachers and learners were traumatised because many had never experienced such a disaster before.

DDE3's account of the situation in his district not only resonated with DDE1's but threw even more harrowing highlights on the contextual differences regarding the intensity and the psychological and economic effects of the floods:

We couldn't even get close to some of the schools because they had completely submerged ... the upper primary and KG blocks were gone. The learners were in school when it happened. We told the headteachers to release the learners to their parents because the situation was chaotic. Some parents were already rushing to pick up their children. It was really devastating. Learners brought their bags and books to school and couldn't pick up a single item ... everything got submerged. The water came with such force that there was no time to save anything.

Discussants of FGD7 added that flood victims from communities also took refuge in the classrooms, competing with teachers and learners for space. This situation did not only

make classrooms inaccessible but also difficult and unsafe for learning. A discussant of FGD1 corroborated:

We find it difficult to concentrate in class... We think about our buildings, we are living with other people who took refuge in the school who are not students, so how do we feel safe and happy to concentrate and learn?

Given that homes were also affected by the floods, these spaces were unsafe and without electricity so learners were unable to learn at home. These realities were supported by the DDEs:

During the flood, educational activities came to a halt in some of the affected schools. Some learners and teachers had their homes flooded and could not find a place to stay, let alone go to school. They had to flee from their communities (DDE2).

As a short-term response, some districts relocated all the schools to one place to ensure that teaching and learning continued (DDE2; DDE3). Apart from these measures, even after the water began to recede, formal learning was still not immediately restored. In the interim, volunteer-led, informal learning became the only option:

The DCE [District Chief Executive] and the MP [Member of Parliament] mobilised volunteers to teach the displaced learners under trees. The teaching wasn't systematic ... it wasn't formal instruction ... but it was a way to occupy the children. They were all traumatised so the volunteers tried to engage them sometimes through songs just to keep them calm and emotionally supported (DDE3).

These accounts point to a breakdown of normal learning routines, where schools no longer functioned as safe and reliable spaces for education, and where both material and psychological disruptions made learning exceptionally difficult. Instructional time was severely lost, learner and teacher attendance significantly declined, and effective participation in classroom activities was greatly diminished. The quantitative data showed that many learners missed weeks of school, while others struggled to concentrate in 'class' because of hunger, fatigue, and emotional distress. The qualitative accounts from learners unmasked the physical, emotional, and academic hardships they endured, including long treks to temporary learning spaces, the destruction of books and desks, and the psychological toll of displacement and loss. At the system level, testimonies from District Directors of Education revealed the complete halting of formal education in several areas, the use of improvised learning environments, and the trauma experienced by teachers and pupils alike.

These findings show that in fragile contexts, the impact of environmental disasters extends well beyond physical access to school. It affects the very conditions under which teaching

and learning occur. It was important that education stakeholders targeted inclusive, and trauma-sensitive interventions to avert exacerbating the already existing learning poverty crisis (Crouch et al., 2021) and undermining Ghana's commitment to equitable and quality education as outlined in the Education Act 778 (Ministry of Education, 2015) and Sustainable Development Goal 4 (United Nations, 2015).

School Leadership

The floods imposed significant stress on school leadership. Table 5 indicates that only 23.1% of school heads rated themselves as effective while an alarming 59.6% considered themselves as ineffective in managing school operations during the flooding period. The logistical burdens associated with coordinating improvised educational settings, alongside the challenge of replacing destroyed materials, were overwhelming for many.

Table 5. School Heads' Effectiveness in Managing School Operations/Activities

Response Category	Frequency	Percent (%)
Very effective	4	7.7
Effective	8	15.4
Neutral	9	17.3
Ineffective	18	34.6
Very ineffective	13	25.0
Total	52	100.0

The interview data corroborated these findings, providing insights on the inability of school leaders to manage day-to-day functions effectively. These included extensive damage to infrastructure, destruction of teaching and learning materials, and the urgent need to coordinate schooling in improvised settings. These factors not only disrupted educational routines but also severely impacted the emotional well-being of school leaders, teachers, and learners alike:

School leaders bear the burden of helping teachers and learners to manage emotional distress in addition to academic recovery. This underscores the holistic challenge of crisis response in educational leadership, extending beyond administrative functions to embrace psychosocial support (DDE2).

Given the necessity to merge schools in single location because of the floods, *School leaders had to go through so much stress to coordinate the movement and teaching of learners in that centralized location. It was a huge logistical and emotional task.* They were also burdened with sourcing for funds or support to replace destroyed school materials; *Once the materials were destroyed by the flood, it also meant school leaders had to find money to replace them*

(DDE1). In cases where classrooms were converted into emergency shelters, school leaders were compelled to go through the enormous activity of formulating and implementing alternative timetables and managing space limitations:

We had to run shifts in this office and in the schools because the classrooms were being used as safe havens by families whose homes were ravaged by the floods. So school leaders had to be flexible and quickly adapt to these new arrangements such as sharing spaces and adjusting timetables (DDE3).

Regarding school heads' perceptions of handling stress and workload during the 2023 floods, respondents' experiences are captured in Table 6.

Table 6. School Heads' Management of Stress and Workload

Response Category	Frequency	Percent (%)
Very effective	5	9.6
Effective	11	21.2
Neutral	4	7.7
Ineffective	15	28.8
Very ineffective	17	32.7
Total	52	100.0

Results in Table 6 indicate that only 30.8% of school heads (n = 16) considered themselves as effective in managing stress and workload, while a significant majority, 61.5% (n = 32) described themselves as ineffective. These results suggest that nearly two-thirds of school heads struggled to manage the demands placed upon them during the flooding period. The data reflects a clear sense of strain, as school leaders had to navigate not only the disruption of school routines and infrastructure but also the emotional and physical toll of working under pressure in a disaster context. Qualitative insights from interviews substantiated the emotional and psychological pressures school leaders faced during the floods:

We also realised that the flood brought trauma to both teachers and learners. Some had never seen anything like that before, so they were really traumatised. School leaders had to bear the burden of having to help teachers and learners manage that emotional burden in addition to their own as well as academic recovery (DDE1).

DDE3 explained that in some instances, school heads had to intervene directly to stabilise staff morale and ensure continuity of instruction; *We had to call the teachers and plead with them to return. School heads had to manage the situation delicately – most of the teachers were traumatised, and leadership was about calming them down and encouraging them to return.*

Community Support

The interviews with the School Management Committee (SMC) members in the affected districts revealed that community support for the affected schools revolved around the issues of participation and governance, immediate access and transport, and learning continuity and rehabilitation.

Participation in school governance

The data showed that community support shifted from routine participation in governance to more sporadic involvement as households themselves struggled to cope with displacement and livelihood loss:

Some community members had their houses flooded... Those who had to cross the water... found it difficult to visit or attend school meetings to offer support. I had to relocate because my house was flooded so when they called for meetings, I had to ask for permission to be absent (SMC 2).

Even where willingness remained strong, capacity to support school activities was constrained because economic activities were brought to a standstill (SMC 1).

Immediate access and transport to school

Practical support coalesced around safe passage to school. In some communities, paid canoe services was a coping mechanism, but that strained already financially or resource-depressed households. As one member reported, *Learners must pay one Ghana cedi to board the canoe to school and pay same to cross back home. This was a financial burden to parents (SMC 2)*. However, collaborative efforts between the SMCs and other stakeholders enabled learners to enjoy fee-free canoe services, indicating some of the ways through which the community supported learners to access teaching and learning in flood-induced distress educational situations (SMC 3).

Learning continuity and small-scale rehabilitation

Where schools were damaged or relocated, communities tried to sustain learning through modest, locally organised strategies and partnerships. These included organising community volunteers to teach literacy and numeracy to learners, and sourcing of funds. For example, SMC3 explained that, *To restore basic infrastructure, SMCs and PTAs partnered with the NGO, Right To Play to rehabilitate some of the schools*. These measures helped to keep a thread of learning in place.

These accounts illustrate a pattern of visible outreach that brought about limited but symbolically important support to the flood affected schools. The data revealed that regular participation in school governance weakened as displacement and livelihood losses

reduced meeting attendance and support by community members. The flood situation compelled communities to redirect their energy toward urgent needs, particularly providing transport across floodwaters, organising volunteer teaching, and raising funds for small-scale rehabilitation.

Overall, the findings demonstrate that the 2023 floods had a profound impact on school leadership, affecting both the operational and emotional capacities of school heads. School leaders were not only tasked with reorganising learning in disrupted and resource-deprived environments but also with provision of support for traumatised staff and learners while dealing with their own personal and professional challenges to ensure continuity of teaching and learning. The evidence clearly indicates that in fragile and disaster-prone contexts, school leadership extends far beyond administrative duties to encompass crisis response, psychosocial support, and adaptive problem-solving.

Research Question 2

What are the perceived impacts of the floods on learners' access to schools in terms of gender and inclusion?

The quantitative data from school heads and teachers suggest that the floods disrupted access to schooling in ways that disproportionately affected girls and learners with disabilities. These are exemplified in terms of their participation in learning activities and the support they received.

Gendered Impacts on Participation

The analysis illuminates significant gender disparities in educational access due to the floods as shown in Figure 9. While 50% of school heads reported parity in participation, 25% observed a greater decrease in girls' participation compared to boys. This suggests that female learners may have been disproportionately affected by the disruptions caused by flooding.

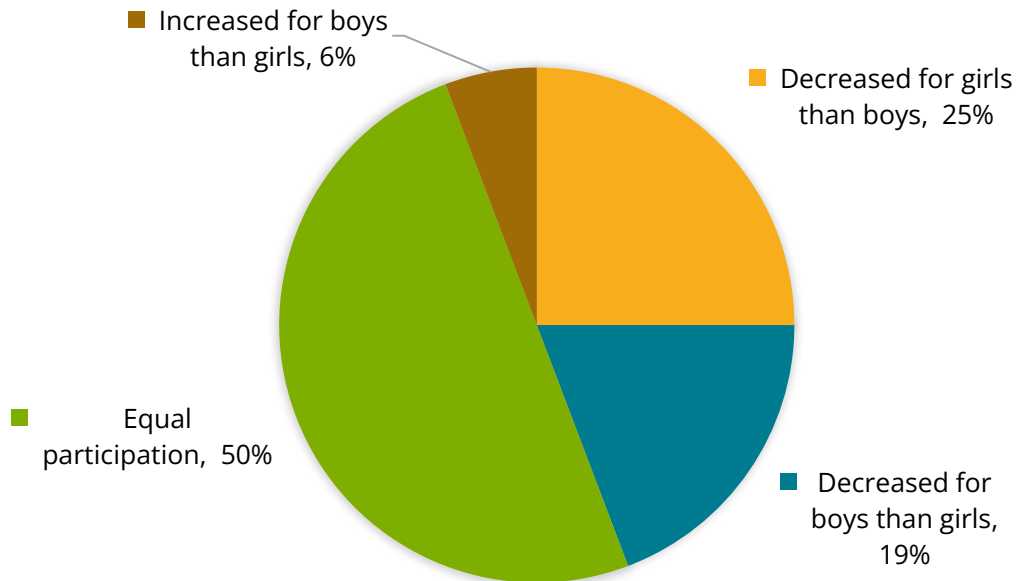


Figure 9. Gender-Specific Impact on Participation

Access and Support for Learners with Disabilities

The study reveals in Figure 10 inadequate support structures for learners with disabilities, with only 31% of school heads perceiving their schools as adequately supporting them. The absence of robust support mechanisms leaves vulnerable learners at greater risk of marginalization in disaster contexts, indicating an urgent need for systemic improvements.

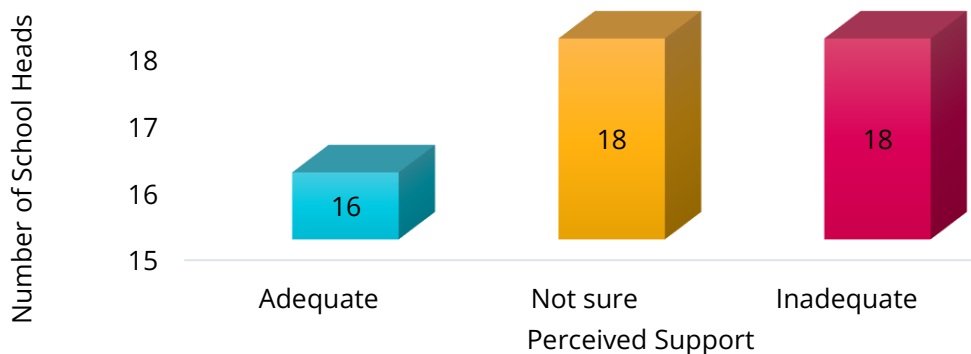


Figure 10. Support for students with disabilities

The equal number of respondents who indicated inadequate support (34.6%) and those who were not sure (34.6%) was particularly telling. The level of uncertainty suggests that school leadership may not be aware of how learners with disabilities were supported in the system generally. This was further exacerbated by learner limited enrolments, weak monitoring systems, or the absence of trained personnel focused on inclusive education. By implication, support for students with disabilities does not seem to be institutionalised or consistently monitored across basic schools in flood-prone areas. In fragile contexts such as the researched schools where learners with disabilities were already at risk of marginalisation, the absence of proactive and visible support structures could further deepen educational exclusion during emergencies.

Classroom Inclusivity Before, During, and After the Floods

In Figure 11, teachers' perceptions of classroom inclusivity before, and after the floods are presented. The data show a disruption in inclusive classroom practices during the flooding, and a partial recovery afterwards.

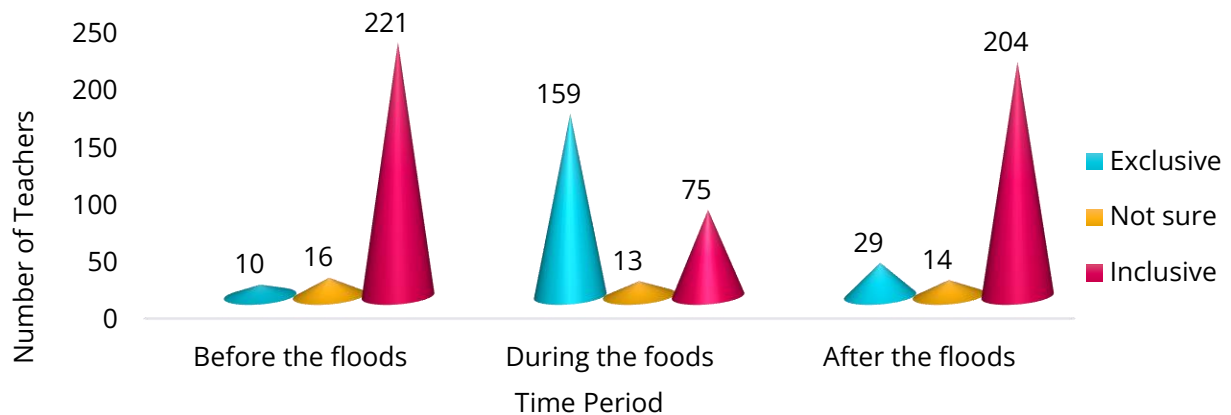


Figure 11. Teachers' Perceptions of Classroom Inclusivity

Prior to the floods, a strong majority of teachers (n = 221; 89.5%) perceived their classrooms as inclusive, with very few describing them as exclusive (n = 10; 4.0%) or not sure (n = 16; 6.5%). These suggest that inclusive teaching practices and environments were generally well established under normal school and classroom contexts. However, during the floods, teachers reporting exclusive classroom situations surged to n = 159 (64.4%), while inclusive classrooms fell drastically to n = 75 (30.4%). This dramatic shift indicates that the flood crisis significantly compromised inclusive education, likely due to overcrowding, resource limitations, or the repurposing of school spaces for emergency shelter. A small group of teachers (n = 13; 5.3%) remained unsure about classroom inclusivity during this

period, perhaps reflecting uncertainty or inconsistent experiences in classroom dynamics. After the floods, perceptions of inclusivity improved to $n = 204$ (82.6%), nearing pre-flood levels. Yet, the number of teachers reporting exclusive classrooms remained relatively high at $n = 29$ (11.7%), nearly tripling the pre-flood figure. This lingering levels of perceived exclusivity suggest that inclusive practices did not fully recover, even after formal schooling resumed. Additionally, the $n = 14$ (5.7%) teachers who remained uncertain, indicate the possibility of some classrooms still operating under unstable or unclear inclusivity standards.

The issue of classroom inclusivity was also explored from the perspective of learners in relation to their pre-flood and post flood experiences through the qualitative data gathered. The learners offered deeper insights into how gender and inclusion were compromised through multiple intersecting issues during the floods, including menstrual dignity and geographical exclusion.

Menstrual Vulnerability, Dignity and Girls' Exclusion

Female learners specifically identified the challenging and uncomfortable conditions created by flooding, which directly compromised their dignity and discouraged attendance during menstruation. During the focus group discussions, members of FGD17 roundly agreed that the flood conditions exposed their menstrual vulnerabilities and tempered with their dignity. As a result, they found themselves either less participative in learning activities or excluded from school altogether. One of the discussants of FGD17 explained:

As girls crossing the water to school, because the water reaches the level of our waist, if we happen to be in that time of our menstrual flow... we feel so disgusted. To come to school with our drenched uniforms and bodies and sit in class to learn, some of us feel so disgusted with ourselves.

These narratives underscore menstrual dignity and personal comfort as critical yet often overlooked dimensions of equitable access to education. Flood-induced conditions thus became significant barriers, culminating in girls absenting themselves voluntarily from school activities due to discomfort, embarrassment, and concerns for their personal safety and dignity.

Geographical Barriers and Transport Challenges

Learners from geographically isolated communities described how flooding of the routes to schools accounted for their inability to reach school promptly, sometimes preventing attendance entirely. Although discussants of FGD1 acknowledged that authorities arranged for a vehicle to transport them to school, the vehicle was not big enough to carry everyone

so some of them had to walk or swim through the flooded routes to school. A discussant who hails from Mefe, one of the distant and flood-prone villages, recounted the frustrations they experienced:

I come from Mefe to school here. If I should walk through the water to school, my books and my uniforms might have been drenched by the time I get to school. So those of us who are forceful to learn have been unduly held back by the floods (FGD14).

For those who had to cross rivers to access their schools, the situation was even more perilous because it meant that only the daring learners could cross such dangerous waters. However, they still faced the challenge of arriving in school on time. This is typified in one of the statements by discussants of FGD7 as they lamented:

Those of our colleagues beyond the river were unable to come to school and those who managed to come don't come early due to the way the flood took over their route... When examination is conducted, they are unable to perform, and their parents complain that paying examination fees is just a waste of money.

With an already existing deficits in social infrastructure, the experiences of learners attest to the worsening of existing geographical and social infrastructural inequalities, exacerbated by the floods. Equitable access to schooling was heavily impaired by the floods as they prolonged commuting times and distances to school and shortened instructional hours. This naturally affects the social and emotional state of learners who have hopes of brighter future through education.

Access Barriers for Learners with Disabilities

Generally, the DDEs recounted that the flooding severely created caused logistical barriers particularly for those with special needs. For instance, one participant explained:

We have special needs learners among us. During the flood, their area was surrounded with water, and their bus got broken down. They needed transportation so they could be evacuated quickly, otherwise, they would have been trapped in school (DDE3).

These accounts unmask the failure of the school system in general to make adequate logistical provision for learners during normal and emergency situations. In some instances, some school leaders were able to improvise, as revealed in the case recounted by DDE1 who said:

There was a school where one of the lower classes had a learner with disability, and their classroom was affected. The new location for the class would have been difficult for the learner to access. So, they moved him to another class so the learner with disability could still attend (DDE1).

Such improvisation could however not be possible for all schools in crises context, unless the system makes standardized provisions to cater for emergency situations. These experiences highlighted the fact that education leaders such as school heads and directors of education were aware of the difficult conditions of their diversified learners, but the system failed to put policy measures in place to support them.

Socio-Economic and Gendered Barriers to School Access

Formal policies for educational access were generally non-discriminatory, allowing both boys and girls to return to school after the floods. Nevertheless, socio-economic and gender-specific challenges disproportionately affected girls' participation:

Some NGOs came to the community and encouraged parents to avoid discrimination in enrolling children in school. But for some parents, getting even basic things like sanitary pads for their daughters is a challenge. That's when the girls start looking elsewhere for support, and it negatively affects their schooling (DDE2).

In some cases, learners, including girls were not with their parents and must fend for themselves, rendering them vulnerable to sexual exploitation (DDE3). These socio-economic vulnerabilities could increase the risk of absenteeism and school dropout.

Despite these commonly agreed barriers among the district education directors, perceptions about the education-related realities vary. For instance, DDE1 emphasised notable progress in female participation and leadership within some schools in his district:

Here, I don't think we've given priority to boys more than girls. In fact, the girls are given a lot of attention; most of the school prefects are girls. We even discussed recently that if we're not careful, there is danger of leaving the boys behind.

The findings revealed that the 2023 floods negatively affected learners' access to schooling in ways that were not evenly experienced across gender and ability. Intersecting factors, including menstrual hygiene, safety, self-dignity, flood-imposed long distances and inaccessible routes discouraged learner school attendance and active participation in learning during the floods. The efforts made at the school and district levels to uphold inclusive access were often ad hoc and insufficiently supported by system-wide provisions.

Research Question 3

In what ways have flood-related challenges influenced the quality of teaching and learning in relation to (a) foundational literacy, and (b) utilisation of age-appropriate teaching and learning materials?

The flood-related shocks or disruptions adversely affected both foundational literacy and the use of age-appropriate materials.

Foundational Literacy

The strong resonance of responses of headteachers and teachers of the flood affected schools as shown in Figures 12 and 13 showed that the floods undermined foundational literacy – reading/writing and numeracy skills.



Figure 12. School Heads' Perception of Effects of the Floods on Foundational Literacy

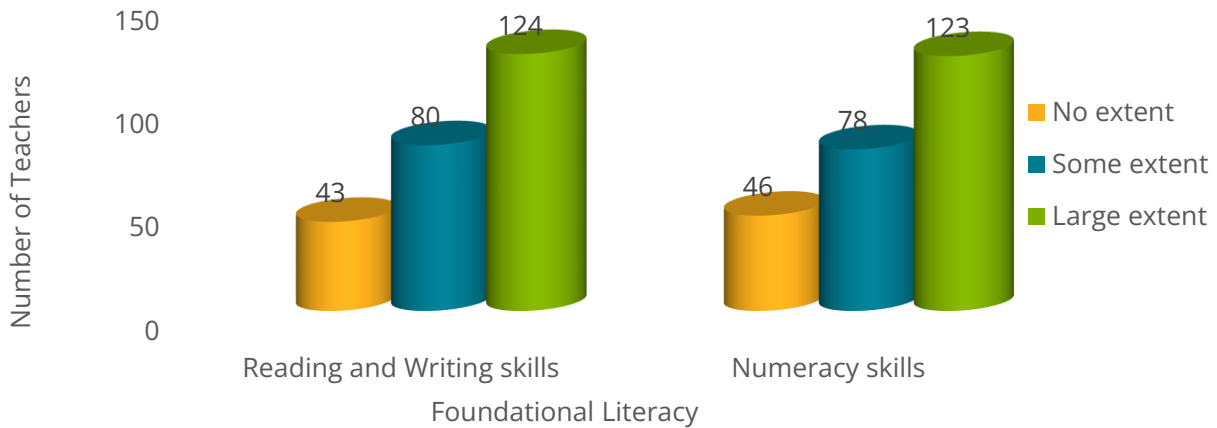


Figure 13. Teachers' Perception of the Effects of the Floods on Foundational Literacy

Among School Heads (n=52), over half reported that reading and writing were affected to a large extent (28 of 52, 53.8%), with a further 34.6% indicating some extent and 11.5% indicating no extent. For numeracy, 48.1% reported a large extent and 44.2% to some extent, leaving 7.7% as no extent. Teachers' responses (n=247) showed a similar pattern. For reading and writing, half reported a large extent (124 of 247, 50.2%) and 32.4% to some extent, with 17.4% reporting no extent. For numeracy, 49.8% reported a large extent and 31.6% to some extent, while 18.6% reported no extent. In other words, about four in five teachers observed meaningful deterioration in both domains.

The qualitative data provided accounts of how the floods undermined children's ability to acquire basic reading, writing, and numeracy skills. Four interrelated themes emerged from the narratives relative to this, namely: loss and damage of books eroded daily practice in reading and writing; poor lighting/dark classroom environments; overcrowding and shortened class time disrupted continuity.

Loss and damage of books eroded daily practice in reading and writing

Accounts of experiences around the flood have generally revealed daily struggles of learners and teachers to accomplish their daily tasks of teaching and learning. The memories of loss of teaching and learning resources through the floods brought them to stark reality of pain, loss and this negatively influenced teaching and learning. An excerpt from the FGD1 captured a struggle of learners that featured across the other discussions: *When the flood waters came, they destroyed everything. They carried our textbooks and notebooks are away. It's difficult to forget this when you try to read or write something. It's like all your hard work is wasted.*

The fact that the probability of recovering the lost or destroyed books very low presented a challenge of losing records of work done, affecting both teacher lesson continuity, and learners' effectively building on previous knowledge. *Some children came to school with nothing, and teachers had to manage teaching without textbooks; at least six pupils shared one textbook resulting in dire consequences on learners' reading and numeracy (SMC 2).*

Poorly lit/dark classroom environments

Learners described their classrooms as unsafe and poorly lit. For example, the discussants of FGD9 explained that *The classrooms [are] dark, so you cannot see or write anything. It affected my reading, my writing... Our learning became poor (FGD 13).*

Displacement, overcrowding and shortened class time disrupted continuity

The SMC members described how relocations and merged classes made systematic literacy teaching difficult to sustain. When the classrooms got flooded, children could not sit to learn. They were standing or sitting on the floor. *Teachers could not lead proper reading and writing lessons in that condition (SMC 1).* SMC 3 add that, *Every day the children have to move from one place to another. There is no stability. The children could not focus on reading and writing because the class time was always disturbed.* These disruptions in classroom routines and arrangement hindered teachers and learners' ability to focus and achieve task within stipulated schedules. With no certainty of one's class location, learners in particular had to locate where their classroom was daily. This came with its own issues of settling before any effective teaching could occur. These flood-induced challenges led to substantial learning loss in foundational skills.

Use of Age-appropriate Textbooks

Figures 14 and 15 show the effects of the floods on the use of age-appropriate textbooks.

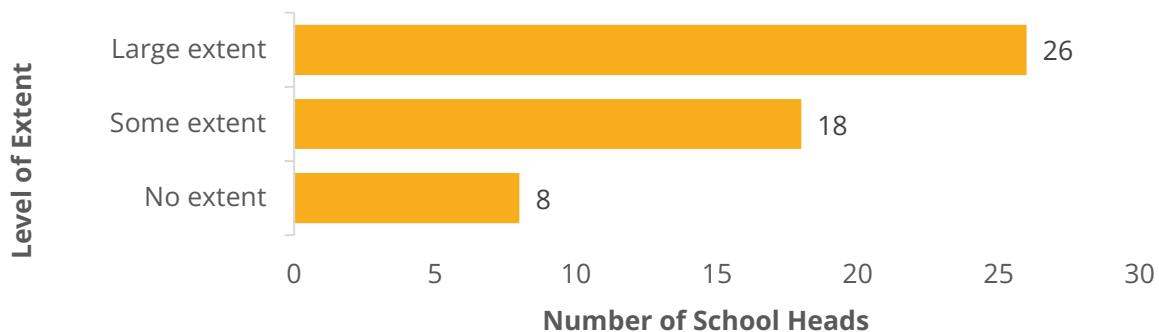


Figure 14. School Heads' Perceived Effect of the Flood on the Use of Age-appropriate Textbooks

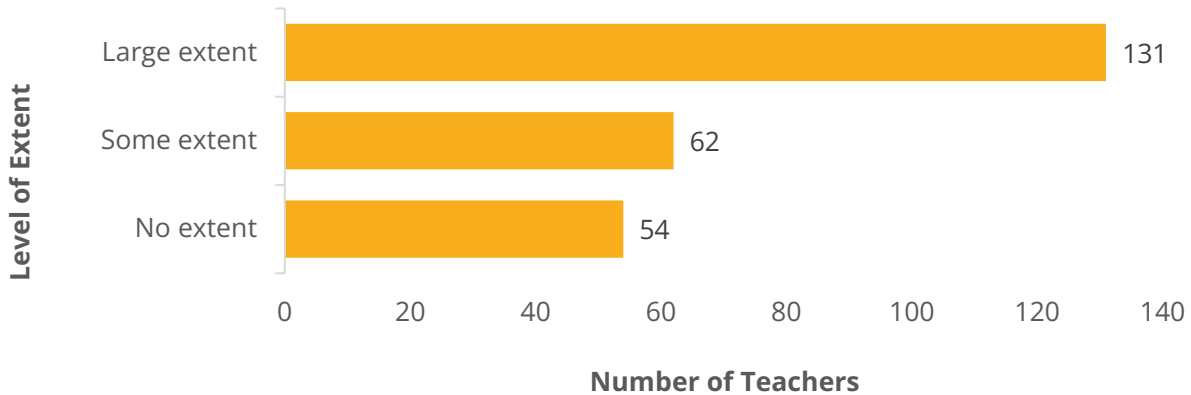


Figure 15. Teachers' Perceived Effects of the Flood on the Use of Age-appropriate Textbooks

Among school heads n = 44 (84.6%) reported that floods affected the use of age-appropriate textbooks and 15.4% to no extent. For teachers (n = 193), 78.1 % indicated that the floods affected use of age appropriate textbooks and 21.9% no extent. The use of age-appropriate textbooks was an issue because 73.1% of school heads reported lack of age-appropriate textbooks during the floods. Before the floods, 93.1% of teachers used age-appropriate textbooks but that dropped to 42.9% during the floods. Insights from the qualitative data showed that the lack of age-appropriate textbooks and other teaching and learning resource influenced the quality of teaching and learning because it reduced children's opportunities to interact meaningfully with texts that were appropriate to their level:

In the temporary classrooms, you can find like five children trying to read one textbook because that is the only age-appropriate textbook available to them. Many others resort to reading whatever material that is available irrespective of its appropriateness for their age. That is why their reading really suffered (SMC 1).

As one District Director explained "Right now they are giving us furniture that isn't age-appropriate. For example, lower primary pupils are receiving desks that are too high, and some have to stand to write. JHS students are using dual desks instead of mono desks" (DDE3).

Classroom furniture and basic ergonometic could shape or influence learners' health, concentration, completion of tasks, and how they write. Ill-fitting desks and mismatched

resources could compromise comfort and posture, which in turn hinder handwriting, attention span, and learning engagement, especially for early-grade learners, who required consistent, hands-on engagement with age-appropriate materials to build foundational literacy skills. For teachers, such conditions made it difficult to teach at the right level.

Research Question 4

What policy measures are in place or could be instituted to (a) make education accessible and inclusive, (b) gender-responsive, and (c) to improve the health and safety of teachers and learners, and the quality of teaching and learning?

Regarding this research question, synthesised qualitative evidence from DDEs and SMC members showed that education policies related to accessibility, gender-responsiveness and safety existed but their implementation fell short in flood-affected schools.

Policy Measures for Accessible and Inclusive Education

The District Directors of Education described a set of measures designed to keep schooling accessible and inclusive in flood-affected areas, while also revealing gaps that limit consistent implementation:

UNICEF organised an Education in Emergency programme for municipal directors and focal persons. After the training, we were tasked to form emergency response teams to plan ahead for disasters like floods or storms. These teams are engaging stakeholders to put in place temporary and long-term measures to ensure accessible and inclusive education provision (DDE1).

This aligns with Education in Emergencies practice and the risk-reduction emphasis in national and global commitments under SDG 4, since it combines preparedness, mitigation and continuity planning. The School Management Committee members echoed similar sentiments and pressed for bolder policies on site-specific actions including permanent relocation of schools out of high-risk zones; Schools situated in flood-prone areas should be relocated to higher ground and special funds be mobilised and made available to schools in flood-prone areas to address any eventuality (SMC 1). The SMC 3 extended this to planning controls and siting standards when he stated that, the Town and Country Planning Officers should insist on the policy of siting schools only in appropriate locations to ensure the safety of learners and educators.

The Directors also emphasised policy intentions around inclusion and non-discrimination with one of them emphasising that inclusivity itself is a national policy that must be strictly adhered to:

We spoke to our teachers, headteachers, and SISOs at different workshops and educated them on the inclusive education policy. We told them to implement the policy which frowns against any form of discrimination against children with challenges, especially those with disabilities in times of disasters (DDE1).

Yet the Directors also acknowledged practical challenges related to inclusion under emergency situations:

We are practising inclusive education. But our school was surrounded by water and the bus that helped to transport the children broke down. This means that we needed standby vehicles to evacuate the children, especially the special needs learners during emergencies. We need permanent safe havens so that schools are not converted into shelters. As I speak, two of our schools are still being used as safe havens, and the learners are under UNICEF tents with unbearable heat (DDE3).

These testimonies show that there are inclusive education friendly policies, but implementation has been a challenge because of weak logical provisions and enforcement.

Non-governmental organisations (NGO) offered material support to bridge some of the gaps. However, such efforts could not and in fact, should not replace the responsibility of Government to ensure that all children access equitable education in safe environments. As one director put it, Some NGOs come in and support us. They provide uniforms, bicycles, and sanitary pads for vulnerable learners to help them return to school (DDE2). These contributions helped to reduce immediate barriers for the most vulnerable learners and were consistent with equity enshrined in the national inclusive education policy. The reliance of the education districts on ad hoc support, signalled a need for dedicated district-level financing and standard operating procedures for floods, including pre-positioned supplies, accessible transport for learners with disabilities, and agreed protocols for relocating classes without resorting to heat-laden learning spaces (tents) for prolonged periods.

Policy Measures for Gender Responsiveness

District Directors described the policy environment as one that promoted gender equity in schooling, while also revealing vulnerabilities that intensified during and after the floods. In some districts, the Directors, including DDE1 and DDE2 perceived strong progress in gender responsiveness that aligned with national commitments to gender parity and stressed the need for such parity to be maintained for both girls and boys. At the same time, the directors identified acute pressures facing girls in flood-affected households, including poverty that disrupted livelihoods and increased lack essentials needs for girls:

Some parents can't afford things like sanitary pads or food, so the girls are left to fend for themselves. That's when they start chasing men for support, and end up with teenage pregnancies. We don't stigmatise them, we encourage even the pregnant ones to return to school, and we support them with basic items and encourage them to stay in school (DDE3).

Such efforts aligned with inclusive re-entry policies and underscored the need for case management, counselling, and referral pathways that connected at-risk girls to services while safeguarding their right to continued learning.

However, some of the SMC members challenged the picture painted by the education directors pointing out, for example, by SMC 2 that, *While sanitary products were provided for the girls, no specific attention was given to the girl child and learners with disabilities.* These accounts suggest that gender-responsive policies in flood-affected contexts should be cognisant of gender parity efforts, targeting measures that cushion household shocks for girls, while maintaining support for boys to gender gaps in education.

Policy Measures for Health, Safety, and Teaching Quality

District Directors described practical safety actions, persistent funding gaps, and post-disaster learning conditions that together shaped the health and safety of school communities and the quality of instruction. On preventive safety:

We are creating awareness for schools to prune or cut down big trees near classrooms to avoid accidents during storms. We have already had incidents where trees fell and damaged school buildings, so we now educate schools to be proactive to avoid such occurrences (DDE1).

Such measures reflected efforts towards preparedness and hazard mitigation at the school level, which were critical in flood- and storm-prone contexts. To be effective, however, these actions needed to be codified in standard operating procedures, inspected routinely, and linked to district maintenance budgets so that schools did not rely on ad hoc initiatives. This is important because the findings revealed financing as a constraint in ensuring both safety and quality:

We need funds to implement safety policies for educators and learners. The funds should be released quarterly or at least annually to district offices. Sometimes we want to take action but can't do anything due to lack of funds. We appeal to the District Assemblies, but nothing comes out of it (DDE1).

Another Director called for dedicated disaster support to safeguard basic essential needs of schools during emergencies:

There should be a special fund set aside to support schools during disasters ...To provide food, water, furniture, teaching and learning resources. During the flood, properties of the school and learners were destroyed, and some children moved to higher ground without anything (DDE2).

These accounts pointed to the need for ring-fenced contingency financing and pre-positioned supplies so that districts could promptly act on the health, safety and instructional needs of educators and learners. Capacity building and community sensitisation were highlighted as complementary measures that could improve the health and safety of learners. For example, Teachers and even learners should be trained on survival skills like swimming or evacuation drills (DDE2). Embedding such training with continuing professional development and school improvement planning can reduce risk to staff and learners, shorten school closures, and protect instructional time.

Summary of Key Findings

In sum, the findings have revealed that the 2023 floods profoundly affected educational processes across the affected schools. Instructional time was severely lost, learner and teacher attendance significantly declined, and effective participation in classroom activities was greatly diminished. The quantitative data showed that many learners missed weeks of school, while others struggled to concentrate when present because of hunger, fatigue, and emotional distress. The qualitative accounts from learners exposed the physical, emotional, and academic hardships they endured, including long treks to temporary learning spaces, where they were confronted with limited access to teaching and learning resources to engage in any meaningful learning. At the system level, testimonies from DDEs revealed the complete halting of formal education in several areas.

With already existing deficits in infrastructure, the floods worsened the situation forcing learners and teachers to work within an environment of constant improvisation in makeshift classrooms where learners at different levels or grades were forced to share the same learning space. The destruction of books and desks also negatively affected access, as classroom participation was heavily disrupted with the need to share the few accessible books among large groups, often consisting of different grade levels. Moreover, the psychological toll of displacement and loss traumatised most teachers and pupils, adding to the stress of the school leadership in managing the schooling space effectively during the floods.

The floods also worsened learners' existing geographical and social infrastructural inequalities as prolonged commuting times and distances ultimately reduced instructional hours. Of the vulnerable groupings, the absence of proactive and visible support structures

deepened educational exclusion for learners with disabilities and girls in their menstrual cycles. This was due to the absence, or fewer supports in place. Absenteeism among both teachers and learners, with the disruptions experienced by those who managed to be in the learning spaces made learning less effective compared to the pre-flood period.

With the region facing low learner retention rates, weak monitoring systems, and absence of trained personnel for inclusive education and schooling in emergencies, the flood-disrupted schooling sought to place education in the region in a constant state of retrogression.

Implications for Policy and Practice

The findings of the study hold several implications for policy and practice.

Policy implications

The frequency of the floods implies there is the need for national dialogue on preparing for and managing schools in floods and similar disaster situations. This would require the total planning of schooling, including siting of schools; providing flood-resistant infrastructure, teaching and learning materials; and managing traumatised learners and teaching staff.

This may require among others:

- Siting schools on higher level grounds
- Using disaster-resistant building designs and materials for schools
- Providing disaster-proof/flood-proof student/school cabinets
- Training teachers in disaster management
- Incorporating disaster management content in pre-tertiary education curriculum
- Establishing school or district level disaster management units, where personnel will be made responsible for disaster management in schools. Their assignment would include educating school staff and learners, and communities in disaster drills, offer counselling to disaster-traumatised victims
- Establishing shelters for disaster victims in communities
- Dedicating district-level financing and standard operating procedures for floods, including pre-positioned supplies, and accessible transport for learners with disabilities.

Practice implications

Regarding practice:

- Regular disaster management drills should be incorporated in the weekly schedules of schools

- Disaster-management topics should constitute one of the core contents offered to teacher trainees and professional learning communities

Limitations

Despite the comprehensive approach adopted in this study, several limitations must be acknowledged. First, the study was conducted in selected flood-affected basic schools within the Volta Region, which may limit the generalizability of the findings to other regions experiencing similar challenges. Second, while the use of questionnaires, focus group discussions, and interviews provided rich data, there is a possibility of response bias, as participants – particularly school heads and teachers may have provided socially desirable responses rather than fully candid assessments of their experiences. It is also important to acknowledge that data analysis tools, including Chi-square test and independent T-test could not be deployed during the data analyses as initially proposed because these proved unsuitable for the revised research questions.

Future Research Directions

Although this study contributed to identifying some of the key issues related to leadership, teaching and learning in some of the flood affected districts in the Volta Region, a follow-up large scale study that focuses on the extent of recovery of quality education post-floods will provide critical lessons or insights for future planning for schooling in flood-prone communities. Another study that analyses/evaluates existing education in emergency-related policies and their effectiveness of implementation can help to identify areas of success and those that need improvement.

CONCLUSIONS

The first major conclusion we draw from the findings is that education systems in disaster-prone districts cannot survive using fragmented emergency responses. The evidence demonstrates that district-level Education in Emergency training organised by UNICEF, whilst well-intentioned, faced critical funding constraints that prevented systematic implementation. School heads confronted logistical challenges, including coordinating learning in improvised settings, replacing destroyed materials, managing their own emotions and traumatised staff and learners, and implementing alternative timetables, often without pre-positioned supplies or standardised operating procedures. Community support, although valuable, was sporadic as families dealt with their own displacement and livelihood losses. Volunteer-led informal learning under trees became the only educational option in some areas as formal instruction was suspended because of the floods. These realities imply that resilience in fragile educational contexts demands institutionalised,

coordinated planning across all agencies. Without ring-fenced contingency financing, pre-positioned supplies, and flood resistant school buildings, education delivery will remain perpetually vulnerable to climate-induced disasters.

The second critical conclusion is that sustaining foundational literacy during disasters is an imperative that requires age-appropriate materials, safe learning spaces, stability, and trauma-informed pedagogy. The data revealed that 53.8% of school heads reported large-scale impacts on reading and writing, and 48.1% on numeracy, with teachers' responses showing similar patterns. The qualitative findings identified four interconnected factors undermining literacy: the destruction of books, poor lighting in temporary or makeshift classrooms, overcrowding and disrupted continuity, and the psychological toll of displacement that hindered learners' concentration. Learner participation in class plummeted from 93.1% before the floods to 9.3% during the disaster, with only partial recovery to 82.4% afterwards. These disruptions did not merely pause learning; they eroded the foundational competencies upon which all subsequent educational attainment depends. The lack of disaster-proof student cabinets to safeguard learning materials, the inadequacy of temporary learning environments, and the absence of trauma-informed pedagogical support meant that learners who were already vulnerable to learning poverty faced compounded disadvantage. Unless education systems prioritise the continuity of foundational literacy instruction as a non-negotiable element of disaster response, climate-induced disruptions will deepen Ghana's learning poverty crisis and undermine efforts to achieve Sustainable Development Goal 4.

The third conclusion relates to gender and inclusion. The findings demonstrate that inclusive education policies must go beyond formal statements and enact standardised emergency protocols, provide pre-positioned accessible transport, and skilled personnel for learners with disabilities. Only 31% of schools were adequately ready for learners with disabilities, whilst 34.6% indicated inadequate support and 34.6% were uncertain. This high level of uncertainty suggests weak monitoring systems and the absence of trained personnel focused on inclusive education. Classroom inclusivity collapsed from 89.5% before the floods to 30.4% during the disaster, with recovery to 82.6% following the floods. Yet, 11.7% of teachers still reported non-inclusive classrooms. Learners with disabilities encountered transport breakdowns, leaving them trapped or unable to access relocated classrooms. Although some school leaders improvised means to sustain learning, such efforts were ad hoc and not codified into system-wide provisions. Similarly, gender-responsive interventions failed to adequately address the socio-economic vulnerabilities that intensify during crises, including menstrual dignity, household poverty, and risks of dropout and teenage pregnancy. Around 25% of school heads observed sharper decreases in girls' participation compared to boys. Female learners cited threats to menstrual dignity

as a critical barrier, explaining how crossing waist-deep floodwaters during menstruation discouraged attendance entirely. Socio-economic vulnerabilities increased the risk of absenteeism and dropout, especially for girls who lacked stable home environments and parental support, exposing them to risks such as teenage pregnancy. Despite national policies prohibiting discrimination, practical implementation during emergencies relied on NGO support for items such as sanitary pads, uniforms, and bicycles, rather than systematic Government provision. Unless inclusive and gender-responsive education policies are operationalised with dedicated resources, trained personnel, and standardised emergency protocols, vulnerable learners will remain disproportionately excluded during disasters.

The fourth conclusion concerns school leadership in fragile contexts. The findings revealed that only 7.7% of school heads rated themselves as effective in managing operations during the floods, whereas 59.6% considered themselves ineffective. Similarly, 61.5% described themselves as ineffective in managing stress and workload. School leadership in disaster contexts extends far beyond administrative duties to encompass crisis response, psychosocial support, and adaptive problem-solving. School heads were not only contending with their own stress but were also responsible for supporting traumatised staff and learners in an overwhelming crisis. District Directors of Education emphasised that school leaders had to navigate not only the disruption of school routines and infrastructure but also the emotional and physical toll of working under pressure in a disaster context. In some instances, school heads had to intervene directly to boost staff morale and ensure continuity of instruction, calling traumatised or displaced teachers back to school and giving them reassuring hope. These accounts illustrate that school leadership in fragile contexts requires targeted capacity development and dedicated resources. Without systematic training in disaster management, psychosocial support, and adaptive problem-solving, school leaders will remain overwhelmed, compromising both their well-being and the quality of educational leadership during crises.

The fifth conclusion underscores that community engagement or support shifted from routine participation in school governance to more sporadic involvement as households themselves tried to cope with displacement and livelihood loss. School Management Committee and Parent-Teacher Association attendance in school governance meetings waned because many members were dislodged from their communities by the floods. Some community members had their houses flooded, and those who had to cross floodwaters found it difficult to visit or attend school meetings to offer support. Practical support coalesced around safe passage to school, with paid canoe services emerging initially as a coping mechanism, which deepened the struggles of already financially

depressed households. Community collaboration with Government and non-governmental organisations was necessary to sustain education delivery during disasters.

Overall, these conclusions point to a fundamental reality: the 2023 floods in the Volta Region exposed profound vulnerabilities not only in the region but in Ghana's education system, particularly in climate-affected regions. Environmental disasters extend well beyond preventing physical access to schools. They dismantle the very conditions under which teaching and learning occur. Instructional time was severely lost, attendance collapsed, foundational literacy deteriorated, age-appropriate materials became unavailable, and gender and inclusion disparities widened. School leaders were overwhelmed, and communities, though willing to support, faced capacity constraints due to their own displacement and livelihood losses. Without Government instituting targeted, inclusive, and trauma-sensitive interventions, such disruptions risk exacerbating the learning poverty crisis and undermining Ghana's commitment to equitable, quality education as outlined in the Education Act 778 and Sustainable Development Goal 4. The findings underscore an urgent imperative: Ghana's education system must transform from reactive approach to crisis management to proactive resilience-building that ensures that learners in flood-affected regions can access equitable, quality education even within fragile contexts.

RECOMMENDATIONS

Based on these findings and conclusions, we make the following recommendations to Ghana's Ministry of Education and its relevant agencies:

Policy Recommendations

1. Site schools on higher grounds of flood-prone districts and use disaster-resistant building materials and designs to construct them to minimise the risk of submersion and structural damage.
2. Provide disaster-proof student cabinets to protect learning materials from water damage. Each classroom in flood-prone areas should be equipped with waterproof storage cabinets to protect textbooks, exercise books, and other learning materials from water damage. This measure will ensure continuity in the availability and use of age-appropriate teaching and learning resources, even during and immediately after flooding events.
3. Establish dedicated district-level financing and standard operating procedures for flood situations. The Ministry of Education should establish ring-fenced contingency financing at the district level, specifically for flood emergencies. This financing should support pre-positioned supplies, including textbooks, furniture, sanitary pads, first aid kits, and emergency learning materials. Standard operating

procedures should be codified to guide the relocation of classes and provision of accessible transport for learners with disabilities. These procedures should be disseminated to all schools and district education offices in flood-prone areas and reviewed annually.

4. Construct permanent community shelters for disaster victims to avert them from invading and converting the few safe schools into emergency accommodation. Classrooms being converted into emergency shelters was a major factor disrupting instruction. The government, in collaboration with the National Disaster Management Organisation should construct permanent community shelters in flood-prone districts. These shelters should be strategically located to serve as safe havens for displaced families, thereby ensuring that schools spaces remain dedicated to teaching and learning.
5. Train in-service teachers in disaster management, including crisis response, trauma-informed pedagogy, and psychosocial first aid.
6. Make disaster management topics core content in teacher training programmes. Colleges of Education and universities offering teacher training programmes should incorporate disaster management as a core component of their curricula. The curricula should incorporate crisis response, trauma-informed pedagogy, and adaptive problem-solving to prepare them for teaching in fragile contexts.
7. Integrate disaster management content into the pre-tertiary curriculum for all learners, covering topics, including disaster preparedness and evacuation procedures. The curriculum integration will build a culture of preparedness for educators and learners.
8. Establish disaster management units at the school and district levels. Every school or district in flood-prone areas should have a disaster management unit, staffed with trained personnel responsible for educating staff and learners on disaster preparedness, conducting regular drills, providing counselling to trauma victims, and coordinating emergency responses. These units should be resourced adequately and integrated into existing school leadership structures.
9. Strengthen inclusive education policies with monitoring systems, trained personnel, and standardised provisions for learners with disabilities during emergencies. The Ghana Education Service should develop and implement standardised emergency protocols for supporting learners with disabilities, including pre-positioned accessible transport such as standby evacuation vehicles, adapted learning materials, and trained special education personnel at the district level. Schools should be required to maintain updated registers of learners with disabilities, and monitoring systems should be strengthened to track the accessibility and inclusivity of emergency education responses.
10. To address the socio-economic vulnerabilities that intensify for girls during floods, the Ministry of Education should collaborate with the Ministry of Gender, Children

and Social Protection to provide targeted support, including provision of free sanitary pads, scholarships, and financial assistance for girls from flood-affected households improve responsiveness. Re-entry policies for pregnant girls should be strengthened and publicised, and community sensitisation campaigns should aim at addressing the risks of teenage pregnancy, social stigma, and dropout during disasters.

11. The government, through the Ministry of Local Government, Decentralisation and Rural Development, should invest in good drainage systems, periodic desilting of gutters and waterways, and the construction of bridges in flood-prone areas. These infrastructural improvements will reduce the frequency and severity of flooding to minimise disruptions to education delivery.

Practice Recommendations

1. Schools in flood-prone areas should integrate and conduct regular disaster management drills, including evacuation procedures and first aid training. These drills should be scheduled at least twice per academic year and should involve learners, teachers, and school management.
2. The Ghana Education Service and schools should integrate survival skills, including swimming, provision of basic first aid, and evacuation procedures into the continuing professional development programmes for in-service teachers in flood-prone districts to enhance teachers' capacity to protect themselves and learners during flood emergencies.
3. District Education Directorates should organise periodic community sensitisation programmes in flood-prone areas, engaging School Management Committees, Parent-Teacher Associations, traditional authorities, and community-based organisations to prepare them for disaster aversion and management and build strong school-community partnerships during emergencies.

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Appendix A: Data Collection Tools

QUESTIONNAIRE FOR TEACHERS

Section A: Socio-Demographic Factors

1. Gender:
 - (a) Male (b) Female
2. Years of Teaching Experience:

Section B: Research Question 1

Frequency of Flood

3. How often do you experience floods?
 - (a) Once a year (b) Twice a year (c) Thrice a year (d) Not applicable
4. How often does your school experience floods?
 - (a) Once a year (b) Twice a year (c) Thrice a year

Intensity of Flood

5. How many days did you miss teaching and learning activities in 2023 due to the floods?
 - (a) 1-5 days (b) 2-4 weeks (c) More a month (d) Not applicable

Teaching Quality

6. Have the floods worsened your teaching activities?
 - (a) Yes (b) No

If yes, go to item 10.

7. On a scale of 1 to 4, how have the floods worsened your teaching activities.
 - 1 = Slightly worsened 2 = Moderately worsened 3 = Severely worsened 4 = Extremely worsened

8. How effective were you in your teaching before, during and after the floods in 2023? Rate your responses on a scale of 1 – 4.

	1 = Very Ineffective	2 = Ineffective	3 = Effective	4 = Very Effective	I don't know
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Before the floods					
During the floods					
After the floods					

Research Question 2

Gender and Inclusion

9. How effective was/is the participation of boys and girls in class?

	1 = Very Ineffective	2 = Ineffective	3 = Effective	4 = Very Effective	I don't know
Before the floods					
During the floods					
After the floods					

10. How inclusive/exclusive do you feel your classroom was/is for all learners, regardless of gender?

	1 = Very exclusive	2 = Exclusive	3 = Inclusive	4 = Very inclusive	I don't know
Before the floods					
During the floods					
After the floods					

11. How well-supported were/are all learners (including those with disabilities) in your classroom?

	1 = Very poorly	2 = Poorly	3 = Well	4 = Very well	I don't know
Before the floods					
During the floods					
After the floods					

Teaching Materials

12. Did/do you use age-appropriate teaching resources (books and supplies) in your lessons?

	Yes	No
Before the floods		
During the floods		
After the floods		

13. How often did/do you use age-appropriate teaching (books and supplies) in your lessons?

	Never	Rarely	Sometimes	Often	Always
Before the floods					
During the floods					
After the floods					

Note: Items in this deal with the aftermath of the floods/post-floods activities

Research Question 3

Influence of Flood-related Challenges on Learning

14. Rate the extent to which the following flood-related issues have affected your teaching on a scale of 1 to 3 where 1 = Minimal extent, 2 = Moderate extent, and 3 = Significant extent.

Flood-related Issues	Learners (Boys & Girls)			Learner with disability			Reading and Writing skills			Numeracy skills			Age-appropriate textbooks and materials		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
School closures															
Destruction of infrastructure															
Loss of teaching and learning time															
Access to school being denied															
Availability of textbooks and materials															

Research Question 4

15. Indicate by ticking as many of the following policy measures that are in place or could be instituted.

Policies	In place	Could be instituted
Provision of Safe Learning Spaces (e.g., Construct temporary shelters in flood-prone areas to ensure the safety of all learners)		
Flexible Schooling Options (e.g., remote learning or mobile classrooms)		
Gender-Sensitive Emergency Preparedness Training (e.g., Train teachers and school staff on the specific needs of girls.		
Gender-Sensitive Disaster Awareness Campaigns (e.g., Incorporate gender-sensitive disaster awareness into school curricula, educating both boys and girls on the importance of safety during floods)		
Scholarships and Financial Aid for Girls (e.g., Provide/seek targeted scholarships or financial assistance to girls whose education may be disrupted due to flood-related economic hardships.)		

QUESTIONNAIRE FOR SCHOOL LEADERS

Section A: Demographics

1. Gender: (a) Male (b) Female
2. Academic Qualification: (a) Diploma (b) First degree (c) Masters
3. Years of Experience as a School Leader: ____

Section B: Effects of Floods on Access, Gender and Inclusion, Foundational Literacy, Age-Appropriate Teaching and Learning Resources

4. How often do you experience floods in your school?
(a) Every year (b) Every two years (c) Every three years (d) Above three years
5. How severe was the flood in your school last year?
(a) Not severe (b) Severe (c) Very severe
6. How have the floods affected student attendance?
(a) Significantly Decreased (b) Decreased (c) No Change (d) Increased (e) Significantly Increased
7. How have the floods affected teacher attendance?
(a) Significantly Decreased (b) Decreased (c) No Change (d) Increased (e) Significantly Increased
8. How have the floods affected the schoolwork of the learners?
(a) Significantly Declined (b) Declined (c) No Change (d) Improved (e) Significantly Improved
9. How have the floods affected the effectiveness of teaching?
(a) Significantly Declined (b) Declined (c) No Change (d) Improved (e) Significantly Improved
10. On a scale of 1 to 5, rate how the floods affected your leadership effectiveness in the following areas. Note that **1 = Very ineffective, 2 = Ineffective, 3 = Neutral, 4 = Effective, and 5 = Very effective**

Leadership Areas	Level of Effectiveness				
	1	2	3	4	5
School operations/activities					
Stress and workload					
Teacher and learner well-being					

Resource allocation					
Community engagement					
Long-term planning and resilience					

11. How have the floods affected the participation of boys and girls in class?

- (a) Decreased for girls than boys (b) Decreased for boys than girls (c) Equal participation (d) Increased for boys than girls (e) Increased for girls than boys

12. How well does your school support students with disabilities?

- (a) Very Poorly (b) Poorly (c) Neutral (d) Well (e) Very Well

13. How have the floods affected the availability of teaching and learning resources (textbooks, exercise books, pencils, pens)?

- (a) Decreased availability (b) Not affected (c) Increased availability

14. How have the floods affected the use of age-appropriate textbooks?

- (a) Decreased usage (b) Not affected (c) Increased usage

15. Rate the extent to which the following flood-related challenges affect teaching and learning in your school on a scale of 1 to 3 where **1 = No extent, 2 = Some extent, and 3 = Large extent.**

Challenges	Learners (Boys & Girls)			Learner with disability			Reading and Writing skills			Numeracy skills			Availability of textbooks and materials			Age-appropriate textbooks and materials		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
(a) School closures																		
(b) Destruction of infrastructure																		
(c) Loss of teaching and learning resources																		

16. Do you have policies on the following areas:

Policy Areas	Policy Availability		Policy Effectiveness		
	Yes	No	Effective	Somehow effective	Not effective

(a) Disaster mitigation					
(b) Educational access					
(c) Gender and inclusion					
(d) Teaching and learning resources					

INTERVIEW GUIDE FOR SCHOOL MANAGEMENT COMMITTEE MEMBERS

1. In your view as a community member, how have the floods in your area affected learners' school attendance, performance, and overall well-being?
2. From your perspective as a community member, how have the floods influenced the community's involvement and support for education?

Probe further for information relating to how the floods:

1. Garnered community support and participation in/for education
2. Ignited cooperation and support for the schools
3. Opened up lines of communication between the school and community
4. Made the school's processes and procedures transparent to the public/community etc.

INTERVIEW GUIDE FOR DISTRICT DIRECTORS OF EDUCATION

1. What existing policies are aimed at improving education accessibility and inclusivity in flood-affected areas? (Prompt for information regarding inclusive policy; EFA policy interventions; SDGs, among other localised policy initiatives)
2. What measures are in place to address gender inequalities in education within these regions? (Probe especially for how specific policies are being implemented to promote equal education access for both sexes of learners)
3. What policy recommendations can be made to enhance the quality of teaching and learning in these contexts?

Probe for specific policy recommendations including:

- Eliminating discriminatory laws
- Increasing funding for disadvantaged and marginalised learners' (e.g. girls') education
- Adopting gender-responsive education systems
- Using localised and gender-sensitive and age-appropriate practices and materials etc.

FOCUS GROUP DISCUSSION FOR BASICs 4 AND 8 LEARNERS

1. In what ways have the floods affected your:
 - a. Attendance to class
 - b. Punctuality in class
 - c. Participation in class activities
 - d. Ability to complete school and homework
 - e. Concentration in class

2. Describe how the floods have affected:
 - a. the availability and use of your school facilities (classrooms, washrooms, playing fields etc.) as boys and girls.
 - b. your ability to read, write and count.
 - c. the availability and use of teaching and learning resources for your learning.

3. Describe how the following flood-related issues have affected (a) you as a boy, girl, or learner with disability (b) your reading, writing and mathematics skills, and (c) your use of teaching and learning resources:
 - a. School closures
 - b. Destruction of school facilities
 - c. Loss of teaching and learning time
 - d. Access to school being denied

Appendix B: Project Work Plan

Tasks	Timeline	Data Collected (Tools/Instruments)	Research Questions	Result/Outcome	Responsible
A0. Inception Activities, Jun-Aug, 2024					
A0.1: Sign grant contract	July 2024			Signed contract document	PI
A0.2: Constitution of a research team and discussion of research contract	July 2024			Competence and experienced researchers working in education	PI
A0.3: Organise inception meeting with stakeholders	July-August 2024			Inception meeting organised	PI, Co-PIs, RAs
A0.4: Obtain ethical clearance from UCCIRB & IEPA Ethical Research Committee	September 2024			Ethical clearance letter	PI, Co-PIs, RAs
A1. Development of Research Instruments, Sep-Oct, 2024					
A1.1: Develop data collection instruments	September 2024	Structured questionnaires, surveys, tests, interview guides, school observation guides, document analysis and policy review guides		Research tools developed	PI, Co-PIs, RAs
A1.2: Recruit and train field data collectors on research instruments	October 2024	Structured questionnaires, surveys, tests, interview guides, school observation guides, document analysis and policy review guides		Enumerators recruited and trained	PI, Co-PIs, RAs

Tasks	Timeline	Data Collected (Tools/Instruments)	Research Questions	Result/Outcome	Responsible
A2. Piloting of Research Instruments, Oct 2024					
A2.1: Pilot testing of research instruments with the participants	October 2024	Structured questionnaires, surveys, tests, interview guides, school observation guides, document analysis and policy review guides		Data collection tools tested and gaps for revision identified	PI, Co-PIs, RAs
A2.2: Revision of research instruments	November 2024	Structured questionnaires, surveys, tests, interview guides, school observation guides, document analysis and policy review guides		Data collection tools finalised	PI, Co-PIs, RAs
A4. Data collection and lessons, November 2024					
A4.1: Collecting data from stakeholders in North Tongu District	November 2024	Research tools to collect quantitative and qualitative data on the: effects of floods on participants impact of the floods on learners' access to schools ways flood-related challenges influenced the quality of teaching and learning policy measures are in place or	RQ1 – RQ 4	Identified effects of floods on participants impact of the floods on learners' access to schools ways flood-related challenges influenced the quality of teaching and learning policy measures in	PI, Co-PIs, RAs, Graduate Student, Enumerators
A4.2: Collecting data from stakeholders in Keta Municipality	November 2024				
A4.3: Collecting data from stakeholders in Central Tongu District	November 2024				
A4.4: Collecting data from stakeholders in Ketu South District	November 2024				

Tasks	Timeline	Data Collected (Tools/Instruments)	Research Questions	Result/Outcome	Responsible
		could be instituted		place or to be instituted	
A4.5: Monitoring data collection activities	November 2024			Monitoring report	PI, Co-PIs, RAs
A3. Write and Submit Mid-term Report, Jan-Mar, 2025					
A3.1: Write and submit a mid-term report	January-March 2025			Mid-term report	PI, Co-PIs, RAs
A5. Data Analysis, Jun-Jul, 2025					
A5.1: Data transcription, cleaning and analysis	June-July 2025		RQ1 – RQ4	Analysed data and analysis report	PI, Co-PIs, RAs
A6. Final Reporting, Aug-Dec, 2025					
A6.1: Write a draft report and research paper	August-October 2025			Draft report	PI, Co-PIs, RAs
A6.2: Validation and sharing of preliminary findings	November 2025			Feedback from stakeholders on preliminary findings	PI, Co-PIs, RAs
A6.3. Dissemination of findings	November 2025			Dissemination report	PI, Co-PIs, RAs
A6.4: Final report submission	December 2025			Final report	PI, Co-PIs, RAs

Appendix C: Definitions of Key Terms

For the purposes of our study, the following terms and variables are defined operationally as follows:

Access to education	Children's ability to enrol in, attend, and progress through school (Kabay, 2021).
Quality education	Fit for purpose environment, teaching and learning resources and attainment in literacy and numeracy.
Educational policy	Principles and regulations that guide and govern an education system to achieve specific goals and objectives.
Gender	Socially constructed roles and relationships, personality traits, attitudes, behaviours, values, relative power, and influence that society ascribes to people.
Inclusion	Embrace of diversity and sense of belonging in a school environment.
Foundational literacy	Ability to read and comprehend age-appropriate texts.
Teaching and learning practices	Dynamic interaction between teachers and learners to impact as well as exchange for human development.
Active learning	Activity engaging students through discussions, problem-solving, case studies, role plays, and other methods (Thompson & Mitchell, 2017).
Gender-responsiveness	Considering norms, roles, and measures to actively reduce gender inequalities (Thompson & Mitchell, 2017).
Fragile contexts	Situations where conflict, violence, or natural disasters have disrupted social and economic systems.
Internally displaced persons (IDPs)	Individuals who have been forced to flee their homes due to man-made or natural disasters but remain within their country's borders (Abu-Ghaida & Silva, 2021).
Basic education	Minimum level of education that all individuals should receive through literacy, numeracy, and life skills.