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Article

University Students' Perception, Knowledge, and Preparedness of Flood Disaster Risk Management in Assam (India)

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ABSTRACT

Assam is a state in India that is highly vulnerable to floods. This study aims to evaluate flood disaster risk perception, knowledge, and preparedness among university students in Assam. A quantitative survey was conducted through an online questionnaire. A total of 50 samples (25 PhD, 25 postgraduate) were collected. Participants were asked about their perceptions of flood risk, knowledge, and preparedness regarding flood disaster risk management. By using the structured questionnaire and Pearson's Chi-Square test to determine the statistical significance of differences between the university students. The finding shows that 96% admit that riverine communities are vulnerable to floods. Although 78% of households need emergency plans, only 4% practice evacuation drills. Eighty-four per cent of PhD students exhibit a higher risk perception of interruption in essential services during a flood. Overall, 62% were aware of the Assam State Disaster Management Authority (ASDMA). At most, 28% understood district-level flood management systems. Awareness of ASDMA notably correlated with trust in timely warnings (52% aware and 48% unaware). Despite 86% of respondents monitoring weather alerts, 82% were unaware of community warning signals, and 56% had an unavailability of emergency contacts. The study highlights an analytical gap between theoretical awareness and practical preparedness among university students in Assam. The findings emphasise the need to integrate disaster drills into academic curricula, strengthen community-institutional partnerships, and develop localised educational tools to bridge this gap. These strategies are necessary for enhancing resilience in flood-prone regions of Assam, establishing knowledge, and promoting actionable preparedness.

KEYWORDS

Disaster; risk management; university students; perception; knowledge; preparedness; flood management; Assam.

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1. Introduction

Floods are among the most devastating natural disasters in the world, often bringing suffering and loss of life. India is ranked high amongst the most flood-prone countries in Asia. The country accounts for approximately one-fifth of global flood-related deaths, nearly 12% of its total land area, and around 40 million hectares are vulnerable to various types of flooding (Mohanty et al., 2020). In India, floods typically occur due to heavy and prolonged monsoon rains. These rains frequently cause rivers and drainage systems to overflow. Other reasons include the narrowing of river channels, erosion of riverbanks, and the accumulation of silt in riverbeds. Poor drainage systems, sudden cloudbursts, and other weather events exacerbate the situation (Bhattacharyya & Bora, 1997; Dhar & Nandargi, 2003). The country has experienced numerous severe floods over the years. One of the worst was the 2012 Assam flood. During the 2014 floods in Assam, 1,846 villages were affected, and approximately 1.6 million people were forced to evacuate their homes. In 2016, the damage increased, affecting 2,893 villages and displacing 1.7 million people (Mohanty et al., 2020). Floods in Assam occur almost every year. About 31,500 square kilometres (12162.33 square miles), or nearly 39.58% of the total land of Assam, is prone to flooding (National Remote Sensing Centre, 2016).

National guidelines recommend that state governments enhance flood management education by incorporating both technical and non-technical knowledge about floods into school and college curricula. At the national level, this includes teaching people what to do before, during, and after a flood to ensure their safety. It also focuses on training key groups, such as elected leaders and government staff, through activities like mock drills. There is also a push for research in flood prediction using tools like scenario analysis and computer models, along with collecting detailed data on rainfall, river flow, and land features. In Assam, the focus is on raising public awareness, sharing flood hazard zone maps with local communities, and establishing monsoon forums at both the state and district levels. Assam also highlights the importance of educating the public about flood risks. (Bezboruah et al., 2021).

National guidelines recommend that state governments can enhance flood management by incorporating both technical and practical knowledge into education. This includes teaching people what to do before, during, and after floods. This also includes training officials through mock drills, conducting research using computer models to predict flood situations, and collecting detailed information about rainfall, rivers, and land (Bezboruah et al., 2021).

According to the Ministry of Education, India (2024), it is estimated that there are 4,33,00000 students enrolled in India during the academic year 2021-2022. In Assam, approximately 40,215 students are studying in all colleges and universities (Directorate of Higher Education, Assam, 2016). Although there are many students in Assam, there remains a lack of research on how they perceive flood risks, their knowledge of floods, their preparedness, and their understanding of commonly used flood-related terms.

This research aims to understand how university students in Assam perceive and comprehend the risk of flooding. The findings can serve as a valuable suggestion to government authorities, institutions, and organisations to incorporate this knowledge into their education and awareness programs. This can be helpful to people and students in better understanding flood risks, making it easier to implement preventive actions that can reduce the damage caused by natural disasters, such as floods (Perić & Cvetković, 2019).

1.1. Theoretical and conceptual understanding

1.1.1. Risk Perception

Risk perception refers to how individuals or communities recognise and assess the likelihood of a disaster occurring, as well as the potential negative consequences associated with it. It is a psychological phenomenon influenced by various factors such as past experiences, personal motivations, emotions like fear and worry, comprehension of the hazard, and social context (Lechowska, 2018).

Within the framework of the psychometric paradigm, individuals make subjective judgments about the severity and acceptability of different risks, as well as the extent to which those risks should be regulated. This approach aims to identify the underlying factors that influence how people perceive various types of risks (Cvetkovic, 2016).

A significant contribution to the development of risk perception theory comes from Paul Slovic and his colleagues (Slovic et al., 1991), who initially explored these perceptions through personality theory and later expanded their work using the psychometric model. Their research emphasised that individuals form perceptions based on personal beliefs and characteristics they associate with specific disasters.

Slovic also proposed two key dimensions of risk perception in the modern world:

- "Risk as feeling" – an intuitive and emotional response to danger.
- "Risk as analysis" – a rational, calculated assessment based on logic and available information.

In one of his well-known studies, Slovic and Weber (Slovic & Weber, 2002) investigated the role of trust in shaping public responses to risk. His findings revealed that trust is fragile, can be easily damaged by a single adverse event, and is difficult to rebuild once lost. This insight is crucial in disaster management, where trust in authorities and communication sources directly affects how people perceive and respond to warnings and preparedness efforts.

1.1.2 Preparedness

Preparedness encompasses both physical actions and psychosocial readiness, enabling individuals and communities to respond effectively to disasters. Social-cognitive biases can influence these actions, highlighting the importance of providing people with accurate risk information and practical preparedness measures to ensure safe and informed responses (Cvetković et al., 2018).

This study also considers how individuals might behave in future disaster scenarios. The Transtheoretical Model of Change views preparedness as a process that evolves through five stages: pre-contemplation, contemplation, preparation, action, and maintenance. Similarly, the Theory of Planned Behavior explains that an individual's intention to act is shaped by subjective norms, attitudes, and perceived behavioural control, all of which vary across individuals and demographic groups (Cvetković et al., 2018; Citizen Corps National Survey, 2006; Ajzen, 1991).

Understanding these variations is important for tailoring education and community-based initiatives that strengthen flood preparedness. Existing research also demonstrates a strong link between disaster-related knowledge and preparedness, highlighting that both proactive (before a disaster) and reactive (during or after a disaster) activities are crucial for mitigating the negative impacts of natural hazards (Cvetković et al., 2015; Cvetković & Janković, 2020).

1.2 Flood Perception

A large body of literature on flood risk perception has constructed a strong understanding of how personal factors such as age, education, and experience are connected to how people understand flood risk (Botzen et al., 2009; Lechowska, 2018; Shah et al., 2020; Lechowska, 2021; Lin & Opdyke, 2024). Even though it is well established that personal factors shape individuals' understanding and response to flood risk (Wachinger et al., 2012; Morris, 2003; Wang et al., 2018), it is important to perceive how young people view flood risks because they can gain the most from efforts to reduce the impact of such disasters.

In Assam, research on students' perception of flood risk is also minimal. In this study, we use the age group defined by the United Nations Office for Disaster Risk Reduction (UNDRR, 2020), which categorises youth as those between 15 and 30 years old, including young adults. This is a broader age range than the one usually used by the United Nations, which defines youth as those aged 15 to 24 (United Nations, 1981). Helping young people better understand flood risks can increase their

awareness of vulnerabilities and encourage them to take action to stay safe (Rufat et al., 2015; Zhong et al., 2021).

1.3 Flood Knowledge

Knowledge is an important part of understanding how people perceive risks(Johnson, 1990). It can improve disaster preparation both directly by encouraging action and indirectly by increasing awareness. Risk education also helps communities to prepare for floods by building their ability to cope with disasters (Dufty & Webber, 2008). These researchers also emphasise that education is crucial for mitigating disaster risks and enhancing community resilience. A study conducted over four years in the United States found that university students generally had a limited awareness of flood risk. Still, their understanding improved as they aged, based on a four-year study in the United States (Ponstingel et al., 2019). Similarly, an evaluation by the New South Wales State Emergency Service (SES) found that communities exposed to flood education programs for over a year were better prepared and more likely to evacuate when needed (Dufty & Webber, 2008). However, even with educational efforts that focus on improving people's understanding of flood warnings and information, many still struggle to comprehend the messages (Árvai, 2014) fully.

1.4 Flood Preparedness

Being prepared for disasters means understanding how people perceive the risks associated with them. Better preparation enhances the ability to reduce the adverse consequences, considering their frequency, nature, and intensity, as well as their cumulative impact on personal safety, which can be achieved through appropriate training (Marčeta & Jurisic, 2024). There is no single standardised approach to disaster management. However, with the common goal of reducing the impact of disasters and promoting a culture of preparedness, the integration of disaster risk reduction practices across various sectors has been considered and implemented. Collaboration between schools and communities in disaster preparedness involves several important and complex factors that contribute to building resilience. The constantly changing environment, shaped by various interconnected elements, extends beyond the existing system and supports cooperation during disasters or in preparation for them. This collaboration creates opportunities to respond more effectively, encourages changes in behaviour, raises stakeholder awareness, and promotes adaptive actions (Rico, 2019).

2. Methods

2.1 Study Design

This study uses a quantitative descriptive survey to evaluate flood disaster risk perception, risk-related knowledge, and preparedness among university students in the state of Assam(India). The primary aim is also to analyse and understand awareness levels and knowledge among two academic groups: PhD students and postgraduate (master's) students. These groups are selected due to their presumed exposure to environmental and disaster-related topics during their academic training.

2.2 Study Population and Sampling Procedure

The target population consisted of a pilot survey of randomly selected PhD and postgraduate students from various universities in Assam, with the inclusion criteria being current enrollment in full-time academic programs at these universities across the state of Assam.

A multistage sampling method was used to choose the study design and participants in Fig.1:

- Stage 1: Assam, as a region, was selected because it is highly affected by floods each year. Flood-prone areas of Assam account for 39.58% of the state's total area. This indicates that the flood-prone area of Assam is four times the national average for flood-prone areas in the country (Government of Assam, India, 2022).
- Stage 2: A purposive sampling method was used to target master's and PhD students, who are more likely to engage with topics related to disaster risk at the university level.
- Stage 3: Participants were randomly selected from groups of master's and PhD students.
- Stage 4: The questionnaire was sent to groups of master's and PhD students. A total of 100 invitations were sent to students studying at universities in Assam to maintain the diversity of our sample. We omitted 10 incomplete responses from the analysis, resulting in 50 (50%) valid surveys.

The survey link was shared with 100 students from multiple universities in Assam through student groups and personal contacts. Survey responses were anonymous to the research team, with participants informed of this before commencing the survey. A total of 50 students participated: 25 PhD students and 25 postgraduate students. Respondents submitted the questionnaire from April 1, 2025, to April 22, 2025.

The sampled students were briefed on research principles and ethics before starting the study, as stated in the heading of the questionnaire. Students were asked about three important aspects and dimensions of disaster risk: perception, knowledge, and preparedness. These included flood disaster risk perception (comprising five indicators), flood disaster risk-related knowledge (comprising four indicators), and preparedness (comprising five indicators).

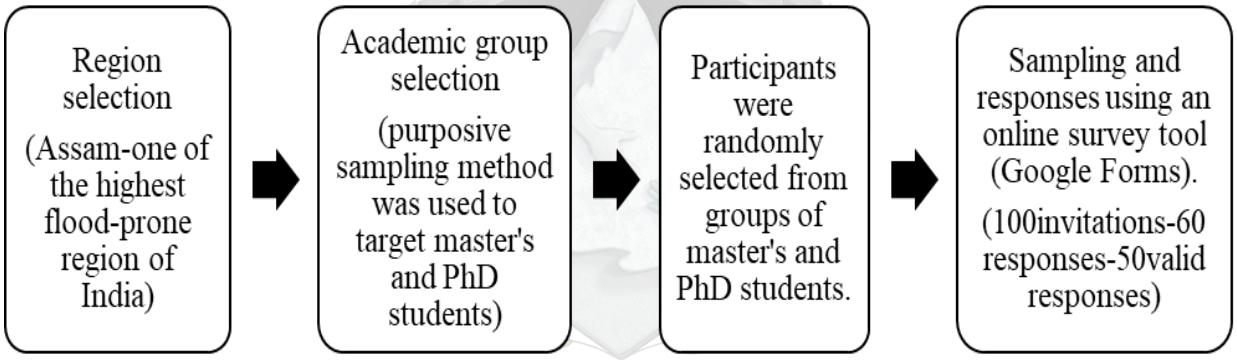

Figure 1. Stepwise sampling strategy of the research.

2.3 Data collection, methodology, and validation

An online survey questionnaire was designed and structured in three main dimensions. In this survey, our focus was on riverine flooding. The data was collected using a structured online questionnaire consisting of three parts:

- Demographic details: (e.g., gender, age, district, residence type, place of permanent residence(urban or rural), district of permanent residence, degree level, educational institution, and the degree they were pursuing.
- Students were asked about their perception of flood disaster risk, knowledge related to flood disasters, and preparedness for flood disasters in Assam.
- Yes/No format questions based on three core themes:

  Perception (5 indicators),
  Knowledge (4 indicators),
  Preparedness (5 indicators).

Before distribution, the questionnaire was reviewed by two subject experts in disaster management to ensure content validity. A pilot test was also conducted with 10 students to assess clarity and

reliability. Minor revisions were made based on feedback, including simplifying technical terms and enhancing the question flow in the questionnaire.

Participants were informed of the voluntary and anonymous nature of the survey, and their consent was obtained before participation. Ethical research practices, including confidentiality and informed consent, were strictly adhered to throughout.

The collected data were systematically entered into spreadsheets and analysed using descriptive statistical methods. This analysis aimed to explore the relationship between students' perception, knowledge, and preparedness concerning flood disaster risks. Special emphasis was placed on understanding how students articulate their awareness of existing disaster management systems. To gain insights into both local and broader awareness levels, several questions were formulated to assess knowledge at the district and state levels. We, therefore, anticipate variations in perception, knowledge, and preparedness at both the master's and PhD levels. This study employs the Pearson Chi-Square test to determine if there is a statistically significant difference in responses between the two educational levels. Pearson's Chi-square test compares the proportion of responses among these two categories with the overall sample proportion. To compute the test statistics for the Pearson test, the following formula is used:

$$X^2 = \sum \frac{(O_i - E)^2}{E}$$

Where is the observed proportion for student i, and E is the expected (overall) proportion. The null hypothesis of Pearson's Chi-Square test of independence is "there is no difference in proportion among groups". If the p-value of the test is less than 5% but greater than 1%, then the null hypothesis is rejected at the 5% significance level. If the p-value is less than 1%, then the null hypothesis is rejected at a 1% level of significance.

3. Results

3.1. Students' Flood Disaster Risk Perception

The survey results in Figure 2 show that 30% of the total sample of student respondents believe that their "home is situated in a flood-prone area of Assam." However, the differences in responses among regions were not statistically significant (P-value = 0.122). When asked about the fatalities, 56% of the total sample respondents think that people will lose their lives in a major flood in their area; this perception was slightly higher among PhD students (60%) compared to master's students (52%). However, no statistically significant difference was found (P-value 0.568).

On average, 80% of the issue of infrastructure and services of the total sampled respondents believed that essential services (e.g. water, electricity, health care, transportation) could be interrupted during a major flood in their area(that belief is more common in PhD(84%) and masters(76%) student. The difference is statistically significant (P-value 0.022). To understand the views of students concerning early warning systems, 62% of the total sampled students felt that flood warnings do not reach students and communities in time to allow them to take safety measures. The difference is found to be statistically insignificant (P-value = 0.145). As shown in Fig. 2, 96% of the total students agreed that "communities living in river basins of Assam are at risk of flood-related disasters" (P-value 1).

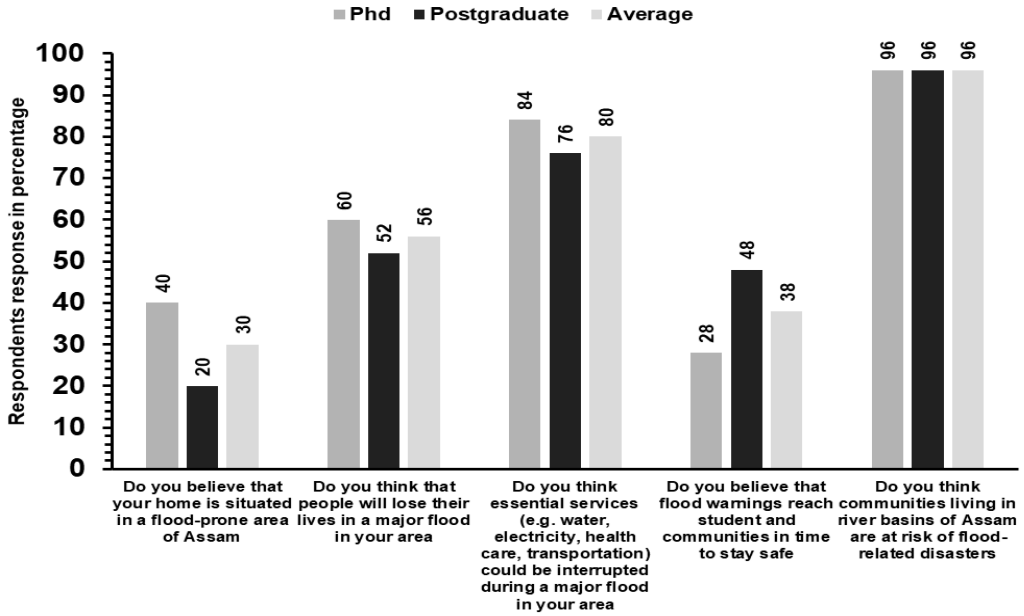

Figure 2. Question on: Students' flood disaster risk perception

3.2 Student flood disaster risk-related knowledge

When students were asked about flood disaster risk-related knowledge, the findings show that, on average, 28% of respondents from PhD programs had experienced flood disasters between 2010 and 2024, with higher rates among PhD students (36%) compared to master's students (20%). However, the differences in flood experience between the two academic groups were not statistically significant (P-value 0.207). 72% of the total respondents students are unaware of the "flood management system of their district," and on average, 28% only know about the system in their district. However, this difference was also not statistically significant (P-value 0.207).

Additionally, 56% of the sampled students were unaware of Assam's flood management policies. This difference was statistically insignificant (P-value 0.568). Nevertheless, 62% of the respondents are aware of the ASDMA (Assam State Disaster Management Authority) and its role in flood response, although the difference is statistically significant (P-value = 0.008). However, compared to this, fewer students are aware of the disaster management system and policies of their district and the state of Assam, respectively.

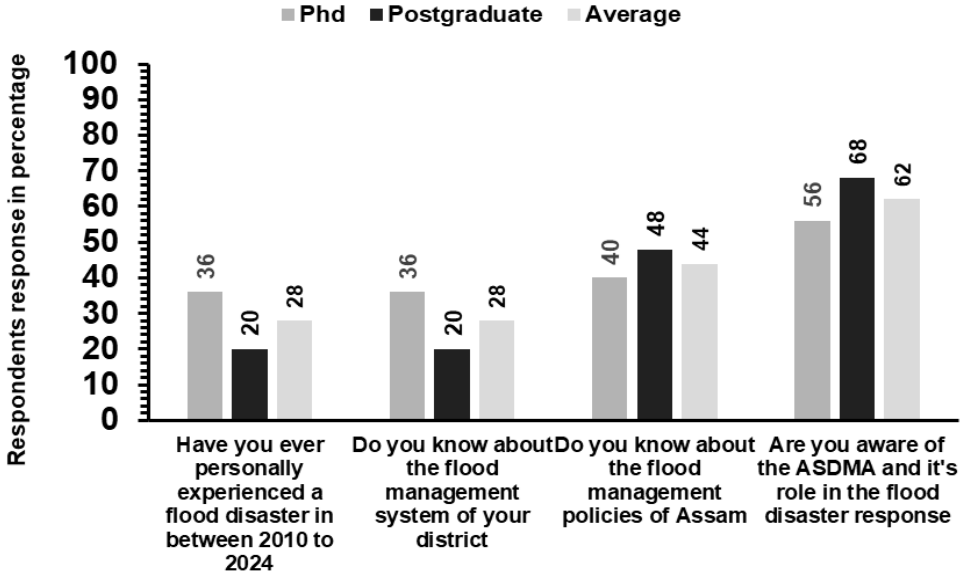

Figure 3. Questions on: Student flood disaster risk-related knowledge

3.3 Student Flood Disaster Risk Preparedness

The results of the current study, as illustrated in Fig.4, reveal a critical gap in flood disaster preparedness among students. A majority of 78% of respondents reported that their families did not have emergency plans within their household. At the same time, only 22% of respondents, on average, confirmed having an emergency family plan at home. Notably, of those emergency plans, only 4% had practised such an evacuation drill with their families. Despite 86% of respondents indicating that they usually monitor weather alerts during the rainy season, a significant gap in community awareness is evident. 82% are not familiar with their community flood warning signals compared to only 18% who are. However, while 42% of respondents know how to contact local emergency services during floods, a larger proportion, 56%, remained unaware of these protocols.

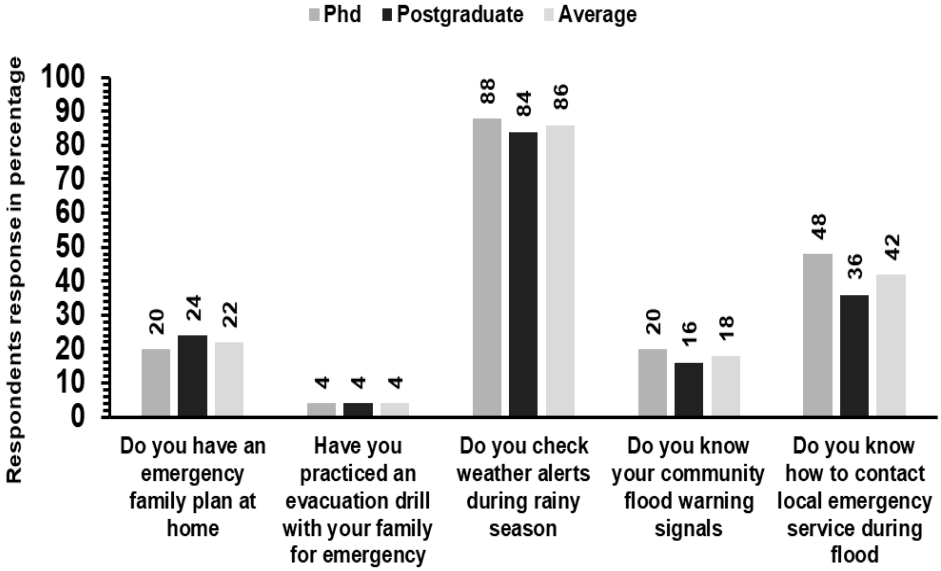

Figure 4. Questions on: Student flood disaster risk preparedness

3.4 Relationship between knowledge and perception

Our analysis revealed a statistically significant association between knowledge and perception among students regarding flood warning systems. Specifically, students who demonstrated awareness of the Assam State Disaster Management Authority (ASDMA) and its role in disaster response exhibited stronger perceptions of the efficacy and timeliness of flood warnings for safeguarding students and communities.

Table 1. Showing the relationship between knowledge and perception

Aware of the ASDMA and its role in the flood disaster response	Believed that flood warnings reach students and communities in time to stay safe
Yes	52%
No	48%
Pearson Chi-Square	6.41
P-value	0.0113

According to the Pearson chi-square test of independence, respondents aware of the Assam State Disaster Management Authority (ASDMA) were four percentage points more likely to perceive flood warnings as reaching them promptly compared to their unaware counterparts. This finding emphasises the critical role of institutional knowledge in shaping community confidence in disaster preparedness systems.

4. Discussion

The findings of this study reveal a noticeable gap between awareness of flood risks and actual preparedness actions among university students in Assam. While a vast majority of respondents acknowledged the flood vulnerability of riverine communities, only a small portion reported taking practical steps such as having emergency plans or participating in evacuation drills. This mismatch echoes earlier findings that theoretical knowledge does not necessarily lead to active preparedness unless supported by practical tools and participatory experiences (Rico, 2019). In the context of disaster risk reduction (DRR), this signals the need to move beyond information-sharing to hands-on, real-world engagement.

One key insight is the role of education in shaping preparedness. Students pursuing PhDs showed a marginally higher risk awareness and trust in institutions like ASDMA, suggesting that higher education may foster greater trust in formal systems. However, this did not significantly increase practical readiness. This aligns with prior research indicating that although formal education improves understanding of disasters, it may also reduce perceived personal risk, as individuals feel more in control due to their knowledge (Perić & Cvetković, 2019). This may help explain why students, despite being aware of the risks, often remain underprepared.

Education also plays a crucial role in how disaster risk is perceived and addressed. Studies have shown that individuals with higher education tend to believe they can manage risk better and, therefore, perceive it as less threatening (Perić & Cvetković, 2019). In our findings, although most students agreed on the importance of preventive measures, relatively few had concrete household plans or engaged in community-level preparedness. This suggests that while education enhances knowledge, it does not always inspire proactive behaviour unless it includes experiential learning or direct involvement in disaster-related activities (Cvetković et al., 2015; Rico, 2019).

Another important issue highlighted in the literature is the influence of early education and family environment. As Cvetković et al. (2015) noted, children and youth often first learn about disaster risks from their families and schools; however, non-formal education also plays a significant role. This indicates that universities should collaborate more closely with local communities to promote disaster awareness beyond the classroom. Preparedness efforts should extend beyond individual settings and into the wider public, fostering a culture of resilience.

Gender, income, and institutional trust were also influential. Similar to other studies, we found that although many students depend on institutional support, few take personal initiative (Cvetković & Janković, 2020). This is especially concerning given that institutional readiness alone cannot ensure community resilience. The safety of students should not rest solely on the assumption that institutions will respond in time. Instead, there is a need to cultivate individual responsibility and community-based action (Dela Cruz & Galanto Ormilla, 2022).

Furthermore, global frameworks, such as the Hyogo Framework for Action, emphasise the importance of education in building a "culture of prevention" (Oktari et al., 2015; Rico, 2019). Universities can be powerful platforms for building such a culture by integrating disaster education into their curricula and offering regular drills, simulations, and student-led preparedness initiatives. These initiatives should also address the needs of diverse student groups based on their backgrounds, income levels, and levels of engagement with formal education systems.

Lastly, the study highlights the limited engagement of students in actual disaster risk reduction (DRR) activities. This highlights a broader challenge in institutional disaster preparedness, where the focus remains on planning rather than on activating and empowering young people. As Cvetković et al. (2018) emphasised, differences in preparedness across groups reflect how social and demographic factors shape disaster risk reduction (DRR) outcomes. For students to become active participants rather than passive observers, universities and institutions like ASDMA must involve them in participatory training and real-world preparedness activities.

These findings underline the need to bridge the gap between awareness and action. Education must be more than just theoretical; it must also be practical, inclusive, and community-oriented. Future efforts should focus on strengthening this link through university-community partnerships,

tailored educational tools, and accessible training programs that prepare young people not only to understand flood risks but also to take action on them.

5. Conclusions

Recognising that various factors influence flood preparedness among university students, it is essential to take targeted actions to bridge the gap between awareness and action. Based on the findings of this study, it is evident that while most students acknowledge the risks of floods in Assam, very few take proactive steps to prepare for them. This disconnect should guide future interventions.

The results suggest that disaster education must move beyond textbooks and awareness posters. Students need regular practice through drills, real-life scenarios, and interactive learning tools. Mock drills, the use of flood safety comics in local languages, and simple games about preparedness can also be helpful. These tools should not only remain in schools or colleges but also reach families and local communities.

Education about disaster risks should be supported with training for teachers and ASDMA staff. When students learn from people who know how floods are managed and how warnings work, they are more likely to trust and follow instructions. More collaboration is needed among institutions such as ASDMA, universities, and village-level organisations. Local flood safety workshops, simple mobile alerts, and community drills can make a big difference in how people act during actual floods.

The results also show that knowledge of institutions like ASDMA increases trust in warnings. Therefore, disaster risk education should include clear information about how disaster management works in Assam. Universities and schools can help bridge this gap by inviting officials to speak or demonstrate safety actions.

Ultimately, further research is necessary to investigate the long-term impact of these efforts on students. It is also necessary to include students from non-academic backgrounds in future studies. As society changes and climate risks intensify, disaster education programs must also evolve to remain practical and relevant.

Author Contributions: Questionnaire, Data, and equation, and their analysis were performed, and Pritisha Barik wrote the manuscript. Pritisha Barik also conducts the survey. The study was guided and reviewed, and Anjan Bhuyan and Sanayanbi Hodam approved the manuscript. Both authors approved the final version of the manuscript**.**

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Conflicts of Interest: The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Appendix A

Table 2. Respondents' details

S.No	Degree level	Total sample
1	Postgraduate	25
2	PhD	25
3	Total	50

Table 3. University students' perception, knowledge, and preparedness-related questions integrated into a single survey

Main components	Sub indicators
Perception	Do you believe that your home is situated in a flood-prone area of Assam?
	Do you think that people will lose their lives in a major flood in your area?
	Do you think essential services (e.g., water, electricity, health care, transportation) could be interrupted during a major flood in your area?
	Do you believe that flood warnings reach students and communities in time to stay safe?
	Do you think communities living in the river basins of Assam are at risk of flood-related disasters?
Knowledge	Have you ever personally experienced a flood disaster between 2010 to 2024?
	Do you know about the flood management system of your district?
	Do you know about the flood management policies of Assam?
	Are you aware of the ASDMA and its role in responding to flood disasters?
Preparedness	Do you have an emergency family plan at home?
	Have you practised an evacuation drill with your family in case of an emergency?
	Do you check weather alerts during the rainy season?
	Do you know your community's flood warning signals?
	Do you know how to contact the local emergency services during a flood?

Source: Questionnaire

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