Final REPORT

A STUDY ON THE DISASTER PREPAREDNESS OF 114 FORMAL PRIMARY SCHOOLS AND ITS COMMUNITIES

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Submitted by

Centre for Climate Change and Environmental Research (C3ER)
Brac University

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Submitted To

NETZ Bangladesh

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Centre for Climate Change and Environmental Research (C3ER)
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Dhaka, 06 February 2024

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ABBREVIATION AND ACRONYMS

ADB	Asian Development Bank
AS	Anandalok School
AT	Anandalok Trust
C3ER	Centre for Climate Change & Environmental Research
DRRO	District Relief & Rehabilitation Office
FGD	Focus Group Discussions
GPS	Government Primary School
GRP	Government Railway Police
GUK	Gana Unnayan Kendra
JCF	Jagorani Chakra Foundation
KII	Key Informant Interviews
LGED	Local Government Engineering Department
MoPME	Ministry of Primary and Mass Education
NGO	Non-Governmental Organization
PEDP-2	Second Primary Education Development Program
PIO	Project Implementation Officer
SMC	School Management Committee
UEO	Upazila Education Officer
UNO	Upazila Nirbahi Officer
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

This study examines disaster preparedness in 114 formal primary schools and their communities in Bangladesh. The study is part of the "SWAPNO" project, which aims to improve education in disaster-prone areas. This report emphasizes the importance of integrating disaster preparedness into educational initiatives. The study involved extensive fieldwork using qualitative and quantitative methodologies to understand the disaster preparedness of the schools. The 114 schools in study locations within Gaibandha, Rangpur, Nilphamari, and Kushtia districts were strategically chosen based on vulnerability to natural disasters.

The findings of the study highlight the adverse impacts of natural disaster on livelihoods, education, and health in the study area. Hazards such as high temperature, drought, flood, cold wave, and thunderstorm, significantly impact these areas. Livelihoods are impacted by decreased agricultural productivity, damaged crop, and loss of income due to flood and drought. The education sector faces challenges such as sudden and long-term school closures, increased child labor, and health issues among students and teachers. Health impacts include cold-borne diseases, malnutrition, and challenges in ensuring healthcare facilities, particularly for children.

The major findings highlight disaster preparedness initiatives by both the community and schools. Communities carry on workshops, knowledge sessions for disaster preparedness initiatives through government financial support. Schools conduct regular awareness programs, emphasize tree planting, provide aid, and use technology for uninterrupted classes and emergency communication. However, there is a lack of insurance coverage for economic risks, no dedicated school committee for disaster risk reduction, insufficient guidelines for post-disaster drills, and no buddy system for assistance.

The majority of schools are constructed and maintained by LGED (56.14% of surveyed schools) and GUK (19.30% of surveyed schools). Funding for these schools primarily comes from LGED, which supports 32.46% of them, followed closely by NETZ, which funds 30.70%. This varied financial support highlights the collaborative effort to ensure proper educational facilities. The size of school premises varies, with only 1.80% of schools covering more than 100 sq km. The majority, 64.00%, occupy areas between 31-40 sq km, while the rest fall between 41 to 99 sq km. 4.40% of schools function as shelters during cyclone and flood, and 3.50% accommodate affected people during disastrous events. Anandalok Trust manages 10.4% of schools, and community-led administration is present in only 0.6% of schools. This distribution highlights the significant role of organized management bodies in school administration.

Most schools are single-storied, with 97% equipped with toilets. Only 2.6% of schools use solar energy, and 13.2% have dustbins for waste disposal. 49.1% of schools have facilities available for persons with disabilities. Furthermore, 98.2% of schools engage in plantation initiatives to ensure natural barriers to reduce the effect of natural disasters. 69.4% of school infrastructures are fully usable, and 79.9% of schools have usable toilets. However, the condition of roads leading to schools is less favorable, with only 14.18% on average being usable.

School children, especially in Anandalok Schools, have a good understanding of disaster events, actively participate in regular drills, and are trained by designated disaster focal persons. Government schools encourage senior students to take on disaster preparedness roles. Moreover, government schoolteachers generally lack sufficient disaster response knowledge, while Anandalok school teachers have received training and actively to monitor the storage of essential items. Anandalok School Management Committees (SMCs) are proactive in disaster awareness and preparedness, organizing programs and meetings. In contrast, government schools lack dedicated disaster management planning committees and need to incorporate a comprehensive approach to disaster preparedness, while Anandalok Schools should focus on specialized training, infrastructure improvements, and clear preparedness strategies.

For integrating disaster preparedness into formal educational, it is needed to include disaster management initiatives into national policies, enhance infrastructure guidelines, develop teaching aids, train teachers, conduct mock drills, establish central repair funds, and improve community collaboration. Emphasis is also placed on sustainable construction, gender-specific facilities, sanitation, accessibility, and ecological balance through active plantation initiatives.

1 INTRODUCTION

1.1 Background and Rationale

The NETZ Partnership for Development and Justice is actively bolstering primary education in Bangladesh, particularly in regions susceptible to frequent natural disasters. Through its BMZ co-funded project "Future-oriented and high-quality education in disaster-prone areas of Bangladesh" (short: SWAPNO), NETZ collaborates with three esteemed local partners: Gana Unnayan Kendra (GUK), Jagorani Chakra Foundation (JCF), and Anandalok Trust for Education and Development (AT). This initiative supports 114 formal primary schools, comprising 80 public primary schools and 34 non-government Anandalok model schools. These institutions are strategically located in remote and char areas of Bangladesh, where the educational landscape is uniquely challenging due to recurrent floods, droughts, and cold waves.

Bangladesh, characterised by an extensive network of rivers, predominantly features a deltaic landform shaped by three central river systems: the Ganges, the Brahmaputra, and the Meghna (Rahman, Sweet, & Hedayutul Islam, 2023). The geographical vulnerability of these areas is compounded by large-scale floods that persist for weeks along significant river courses. The consequences are profound, encompassing the destruction of infrastructure, crop failures, the spread of water-borne diseases like cholera, and protracted loss of income, particularly affecting family's dependent on daily labour. Recognising the difficulties of such situations, NETZ acknowledges the need to occasionally interrupt project activities to prioritise the safety and livelihoods of the target population—underscoring the imperative of integrating disaster preparedness into development initiatives. The SWAPNO project aligns with the broader social sustainability goal, emphasising the realisation of the Right to Education for children from marginalised communities. Moreover, it seeks to facilitate the seamless integration of these children and their families into their respective communities, concurrently addressing the critical aspect of disaster preparedness and resilience strengthening within schools and communities.

The early childhood phase is a pivotal period in holistic development across the lifespan. The learning and growth of children during this time are intricately shaped by a myriad of environmental factors that envelop them (Azam & Halim, 2016). Over the 5-year cycle of primary education, spanning ages 6 to 10, students acquire foundational skills in reading, writing, comprehension, and computation. These skills serve as essential tools, preparing them for the workforce's demands and the pursuit of advanced education (Ali & Hossain, 2010). This primary education program is not a solitary endeavour but a collaborative effort with local partners, each contributing unique expertise. Anandalok Trust (AT) focuses on inclusive and quality pre-primary and primary education, emphasising a value-based, child-centered pedagogy. Gana Unnayan Kendra (GUK) employs a rights-based approach to empower those living in extreme poverty, collaborating with NETZ since 2003 on primary education and food security initiatives. Jagorani Chakra Foundation (JCF), established in 1977, directs its efforts toward marginalised communities' socio-economic and cultural rights, partnering with NETZ since 2007 in primary education and food security programs.

NETZ, operating in Bangladesh from its Dhaka office, brings experience managing development programs and advocating for civil society at both local and international levels. Complementing this, the Centre for Climate Change & Environmental Research (C3ER) at Brac University, well-versed in projects related to disaster resilience, has been entrusted with the study titled "Facilitating a study on the disaster preparedness of 114 formal primary schools and its communities."

In pursuing the comprehensive research initiative, a dedicated team conducted extensive fieldwork across multiple upazilas in Bangladesh. Employing a carefully chosen set of methods, combining qualitative and quantitative methodologies, aimed to provide a comprehensive understanding of the preparedness and resilience of formal primary schools in the face of natural disasters. The fieldwork across diverse geographic and social contexts identified immediate challenges and unearthed latent growth and community development opportunities. The rich tapestry of perspectives and experiences gathered during this meticulous fieldwork forms the bedrock of our research project, promising to contribute significantly to our nuanced understanding of the intricate interplay between education, disaster resilience, and community dynamics in these vulnerable regions.

1.2 Objectives of the Study

The objective of the assignment is to assess the needs of the 114 formal primary schools regarding disaster preparedness. The assessment needs to include the following areas: 1) infrastructure, 2) capacity building of school communities, including the school authorities, and 3) community mobilisation.

1.3 Scope of the Study

The scope of the study titled "Facilitating a Study on the Disaster Preparedness of 114 Formal Primary Schools and Its Communities" is to conduct a comprehensive assessment of disaster preparedness and resilience in 114 formal primary schools and their respective communities in Bangladesh. This study, led by the Centre for Climate Change & Environmental Research (C3ER) at Brac University, aims to understand the interplay between education, disaster resilience, and community dynamics in vulnerable regions. It encompasses diverse geographic and social contexts, involving extensive fieldwork, qualitative methods such as focus group discussions (FGD), key informant interviews (KII), and quantitative methodologies. The study seeks to identify immediate challenges and latent growth opportunities, contributing significantly to a nuanced understanding of disaster dynamics and community responses in these areas.

2 LITERATURE REVIEW

2.1 Disaster Risk of Bangladesh

Bangladesh, a developing country, suffers a lot from natural disasters. The country's lack of management and technological afford is a big issue, mainly due to its limited resources, weak infrastructure and lack of disaster preparedness plan (Abu Reza Md. Towfiqul Islam, 2014). Additionally, poverty and a dense population have further decreased Bangladesh's capacity to adapt in the face of catastrophes, increasing the intensity of the effects of disasters. Bangladesh is now listed as one of the most vulnerable nations to natural disasters due to its geography (Udayangani Kulatunga, 2012). As per the historical events and potential damages, cyclones, earthquakes, floods, groundwater contamination, and tornadoes have always posed the most significant risks to Bangladesh (Uttama Barua, 2016). Even within that monsoon, floods and tropical cyclones possessed the highest capability for destruction in the country, from infrastructure destruction to social disruption to loss of lives. Tropical cyclones like Amphan, Aila and Sidr are a few of the cyclonic disasters that devastated Bangladesh. Cyclone Sidr, which landed in Bangladesh in November 2007, singlehandedly killed 15,000 people, making it the second giant cyclone after Bhola in 1991, which killed around 143,000 Bangladeshis. Thousands of people have died as a result of Sidr, but the devastation to houses, crops, and livelihoods was enormous and was allegedly at its worst. Cyclone Amphan was a recent phenomenon in the country that hit May 2020. The official death toll was just 17, but the UN estimates a total of 10 million people and 19 districts were affected. As per MoDMR, 330,667 houses were damaged, including 55,667 destroyed in the nine most impacted districts: Khulna, Satkhira, Barguna, Bhola, Patuakhali, Pirojpur, Noakhali, Bagerhat and Jessore (Center for Excellence in Disaster Management & Humanitarian Assistance, 2020).

Monsoon floods, on the other hand, cover about 20% of the country, disrupting livelihoods and causing deaths. Over 60% of Bangladesh gets submerged when monsoon floods are deemed severe. Over 52,000 people have died from floods in the past 100 years, with over 4 million people having lost their homes and over 300 million people having been impacted in total. Severe monsoon floods usually occur between July and September, inundating two-thirds of Bangladesh. Killing thousands with economic losses. Investigations through the MoDMR found the effects of the floods were the worst in the last four decades, followed by another assessment which highlighted that in northern Bangladesh, six of the most affected districts seen Gaibhandha, Dinajpur, Kurigram, Jamalpur, Nilphamari, Sirajganj (Center for Excellence in Disaster Management & Humanitarian Assistance, 2020).Throughout Bangladesh's history, such disasters have repeatedly harmed the people and their livelihoods. Resulting in significant losses of human lives and infrastructure destruction. This causes the social balance of their livelihood to become fractured and unstable. There is a tremendous lack within the current disaster management system and policies. This is due to inadequate institutional arrangements for dealing with disaster-related issues, collaboration and communication gaps between different levels of the NGO sectors, and a lack of specific strategies for reconstruction and rehabilitation (Abu Reza Md. Towfiqul Islam, 2014). Hence, a proper establishment is needed through institutional and governance levels for

such scenarios to be prevented feasibly.

2.2 Disaster Risk of the Study Locations

Major disasters in the Gaibandha district are monsoon floods, cyclones, drought, storm surges and thunderstorms and lighting, with the effects of floods being significantly severe, disrupting the livelihoods of approximately 17,7390 households between 2015-2020. The same scenario is seen in Kushtia district, but apart from floods, the district is also heavily impacted by cyclones, with almost 17,011 households being affected from 2015 to 2020. On the other hand, the Rangpur district experiences disasters such as floods, cyclones, drought, tornados, thunderstorms, and lightning. Floods and thunderstorms were the most impactful natural disasters within the district, causing 168,618 households to be affected between 2015 and 2020. The primary natural disasters within Nilphamari district are monsoon floods, tornados, and thunderstorms. Cyclones are hardly recorded to impact livelihood, with floods being the most severe of the natural disasters impacting approx. 56,899 households in the year range (Bangladesh Bureau of Statistics, 2021).

Bangladesh is extremely susceptible to recurrent disasters, and the effects of climate change will make matters worse. The nation lacks data-driven decision-making, and the majority of the time, decisions are made using statistics on poverty. According to the analysis of (Reliefweb, 2021) within the period of 2014 to 2020, 15 major disasters affected 42 million people, displaced 9.4 million people, damaged 4.6 million houses either fully or partially, caused 1,053 deaths, and resulted in an economic loss of $4.1 billion in Bangladesh. Both monsoon and flash flood affected 34.9 million people which covered about 83% of the disaster affected population. As per the multi hazard risk analysis report, the northern part of Bangladesh is exposed as high risk area, prioritizing Kurigram, Gaibandha, Jamalpur and Sirajganj districts.

2.3 Impact of Disaster on Schools and Children

The aforementioned natural disasters significantly affect the study areas and their households. The children and their livelihoods face a devastating scenario that need to be addressed and assessed. Additionally, BBS 2021 revealed a comparison between the years 2021 and 2015 on reason of not attending school by children aged between 5 to 17 years. The number of sick or injured children who couldn't attend school due to natural disasters are 112808 and 735309 students for the years 2025 and 2015 respectively. Such records were also found for the selected study locations.

When focusing on sick children, it has been documented that within Gaibandha, there have been a significant number of children, 29,313 to be precise, recorded as not being able to attend schools due to natural disasters. Meanwhile, in Kushtia, the number was consequentially smaller, with just 1,611. The scenario in Rangpur district is much higher when compared to Kushtia (16,042), indicating that the district disaster scenario is much more severe. Lastly, in Nilphamari district, the number of children not attending schools was 8,317, to be exact. The number of children not attending schools was significantly higher than the number of children who could attend in all of the studies districts. Additionally, it has been recorded that, multiple factors such as communication disruption, school destruction, school infrastructural damage, household income loss, and

physical injury are the most common factors that refrain students to attend school. As per the 2021 survey report, disasters affected school infrastructures and 28733 students from age 5-17 could not attend school. Due to household income loss 14596 students were refrained from education. 10875 students books were spoiled, 297347 students faced difficulty to attend school because of transportation and communication disruption (Bangladesh Bureau of Statistics, 2021) .

3 Synthesis of National Policy and Legislative Framework

Education is one of the mandatory rights of people and disasters have the potential to harm this sector. Disaster damages school infrastructure, disrupts educational activities, and displaces children and their families. Children also lose their learning materials. According to UNICEF, on average, 900 schools in Bangladesh suffer severe damage from floods, cyclones, and river erosion every year. More than 4,666 schools are affected by disasters per year. Inclusion of disaster education at the policy level may help improve primary schools' disaster preparedness and its communities in remote areas of Bangladesh (Quayyum & Chowdhury, 2016). The brief synthesis of significant national policies and legal framework is as follows:

The **National Education Policy, 2010,** was formulated by the Ministry of Education to ensure proper quality education and knowledge of science and technology. This document prioritised disaster preparedness and aimed to build students as skilled human resources to fight the challenges of the world threatened by climate change and other natural disasters and to create social awareness about the environment. Moreover, it also emphasised including a specific subject, such as Natural Environment, emphasising topics like climate change in the curriculum as a compulsory subject for all students of diverse streams from primary to higher education. This document stated the quality of education and emphasised ensuring proper physical infrastructure development, proper management, and adequate facilities (MoE, 2010).

The **Disaster Management Act** was published in 2012 to coordinate, object-oriented, and strengthen disaster management activities and formulate rules to build up the infrastructure of effective disaster management to fight all types of disasters. This document entirely focuses on coordinating and strengthening disaster management activities and formulating rules for effective disaster management (GoB, 2012).

The **National Disaster Management Policy** was formulated in 2015 to reduce the risk of the people, especially the poor and the underprivileged, to a humane and acceptable level in the case of natural, environmental and man-made disasters and to prepare a capable and effective emergency response system to deal with large-scale disasters. The first objective of this document is 'Establishing a culture of disaster preparedness, risk reduction and resilience through knowledge, technology innovation and education'. Moreover, it emphasised extending disaster management education and infrastructural improvement for effective disaster risk management. The document fully supported to involve disaster management in primary to master's level of education, updating primary and secondary curriculum. Additionally, it also accentuated to prepare a fire emergency plan as a disaster preparedness mechanism and arrange mock drills. In every disaster-prone region, the primary and secondary schools are guided to establish a disaster management committee along with school management committee and generate a safety network. If any area gets affected by any disaster, different educational arrangement needs to be set up for ensuring undisrupted education (MoDMR, National Disaster Management Policy, 2015).

The **National Plan for Disaster Management 2021-2025** was published in 2020 with the vision of 'Winning resilience against all odds'. The document emphasises capacity building for strengthening in disaster risk reduction. This document stated the importance of school infrastructures usage as cyclone shelters during disasters and its value for ensuring safety of the affected population. One of the key activities for fulfilment of the plan is reviewing and updating the national curriculum up to higher secondary education for improving disaster preparedness activities (MoDMR, National Plan for Disaster Management 2021-2025, 2020).

3.1 Policy Gap Analysis

The national policy documents regarding disaster management (i.e., Disaster Management Act, National Disaster Management Policy and National Plan for Disaster Management 2021-2025) illustrated the necessity for including disaster management in the national curriculum. However, there remains a lack of adequate bridging education with disaster management.

Though **the National Education Policy** emphasised updating the national curriculum and climate change issues, disaster management aspects and relevant mock drills were not considered mandatory. Also, it did not provide guidelines on the physical infrastructures or using the structures as schools cum shelters.

As a sole document on coordinating and strengthening disaster management activities and formulating rules for authorities, **the Disaster Management Act** did not address the school management committee's role in lessening disaster risk and instructions on using school infrastructure as shelter. On the other hand, **the National Disaster Management Policy** supported updating the national curriculum and the role of the school management committee. It only emphasised preparing emergency plans for fire hazards. Every hazard should have been prioritised and action plans should have been prepared for effective disaster risk reduction. Moreover, **the National Plan for Disaster Management 2021-2025** provided a particular emphasis on using the school infrastructures as cyclone shelters, it did not provide any detailed guidelines on building the infrastructure, which limits bridging education with disaster management activities. The school committee's involvement was not clearly stated and the community-led organisation's interaction to increase dependency on the school committee was also not addressed.

4 METHODOLOGICAL FRAMEWORK

A structured methodological framework was followed under this study. Each step of the proposed framework has a list of activities and targets in this study. To achieve the objectives of the study, the team adopted a comprehensive methodology in each of the activities, e.g., document review, team mobilisation, data collection and report preparation. A mixed-method design, where both qualitative and quantitative data (both primary and secondary) was collected from the schools and other relevant stakeholders. The following steps have been followed while conducting the study in the primarily selected locations:

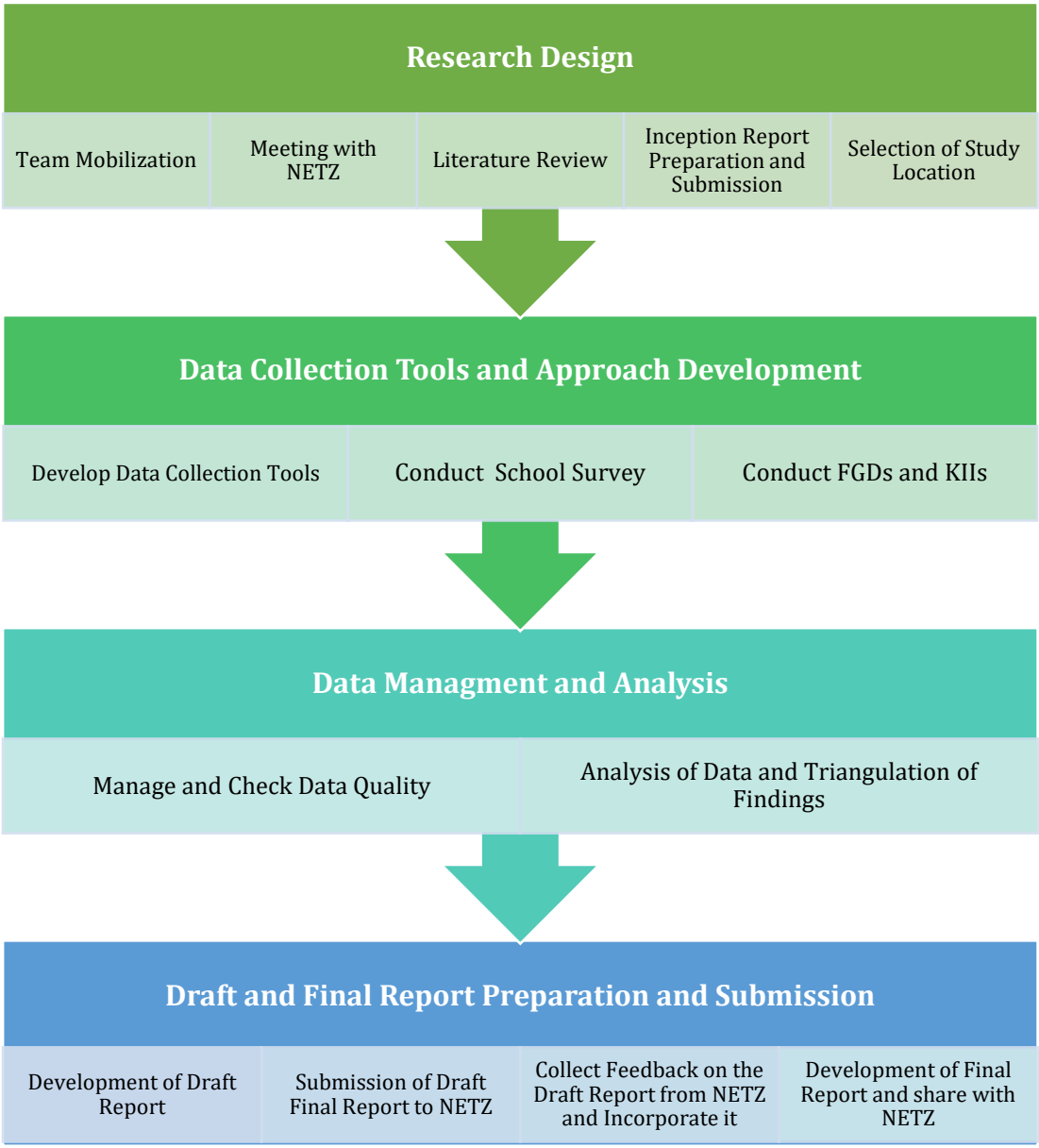

Figure 1 Methodological Workflow of the study

4.1 Research Design

4.1.1 Team Mobilisation

Under the direct supervision of a Team Leader, an expert team, including a Disaster Management Expert, Anthropologist, Data Science Expert, etc. lead the team. Under the expert team's guidance, a field team was deployed for collecting primary and secondary data.

4.1.2 Initial meeting

An initial meeting was organised between the C3ER and the NETZ Project team to share the background and objectives of the project. The discussion also covered the proposed methodological framework and overall operation of the project.

4.1.3 Literature Review

Under this activity, an extensive desk review was conducted to understand the overall context of the project. Relevant project documents were reviewed and analysed to get comprehensive knowledge about the project and its goal. Moreover, various research reports, journal articles, newspaper articles, and other documents were examined under this desk research to understand the disaster preparedness mechanism of the schools. This desk review enabled the study team to effectively comprehend and review the existing context and background study to plan and develop the research and prepare the study report. The study team also reviewed a few policy documents to understand the national response towards disaster preparedness and resilience. The team was benefitted from the policy review to formulate the recommendations.

4.1.4 Inception Report Preparation and Submission

Based on the outcome of the initial meeting, the team has prepared an inception report addressing- an understanding of the issues and questions, study area selection, data sources and how to assess the questions, detailed methodology and detailed budget. The inception report was shared with the project team of NETZ Bangladesh for their review. After receiving feedback from them, the inception report was finalised and shared accordingly.

4.1.5 Selection of Study Locations

The selection of study areas for this research initiative, which includes regions such as Kaunia, Pirgacha, Gangachara, Jaldhaka, Domar, Nilphamari Sadar, Debiganj, Khoksa, Kumarkhali, Fulchari, Gaibandha Sadar, Saghata, and Sundarganj within Gaibandha, Rangpur, Nilphamari, and Kushtia districts, is driven by a strategic rationale. These areas were deliberately chosen due to their heightened vulnerability to frequent natural disasters, notably floods, droughts, and cold waves. This susceptibility is accentuated by Bangladesh's extensive river systems, primarily the Ganges, Brahmaputra, and Meghna rivers, which shape the deltaic landform. Consequently, these regions often experience prolonged and devastating floods, resulting in infrastructure damage, crop failures, and the outbreak of water-borne diseases. This strategic selection of study locations is essential for understanding disaster dynamics comprehensively in such vulnerable areas and informing disaster preparedness and resilience strategies. The study team surveyed 114 schools

under the four selected districts to attain the main and specific objectives of the study. The following table and map show the location wise distribution of surveyed schools-

Table 1 District and Upazila-wise School List under the SWAPNO Project

District	Upazila	Formal school (GPS)	Anandalok School (AS)
Gaibandha	Fulchari	10	4
	Gaibandha Sadar	10	3
	Shaghata	-	1
	Sundarganj	-	3
Rangpur	Kaunia	10	2
	Pirgacha	10	2
	Gangachara	-	5
Nilphamari	Domar	-	5
	Jaldhaka	10	1
	Debiganj	-	5
	NilphamariSadar	10	-
Kushtia	Khoksa	10	3
	Kumarkhali	10	-
Total		**80**	**34**

The schools are situated beside major river networks Jamuna- Ganges-Padma where flood is evident every year. Majority of the schools are situated by the side of Jamuna and Ganges River which makes the schools vulnerable to flooding.

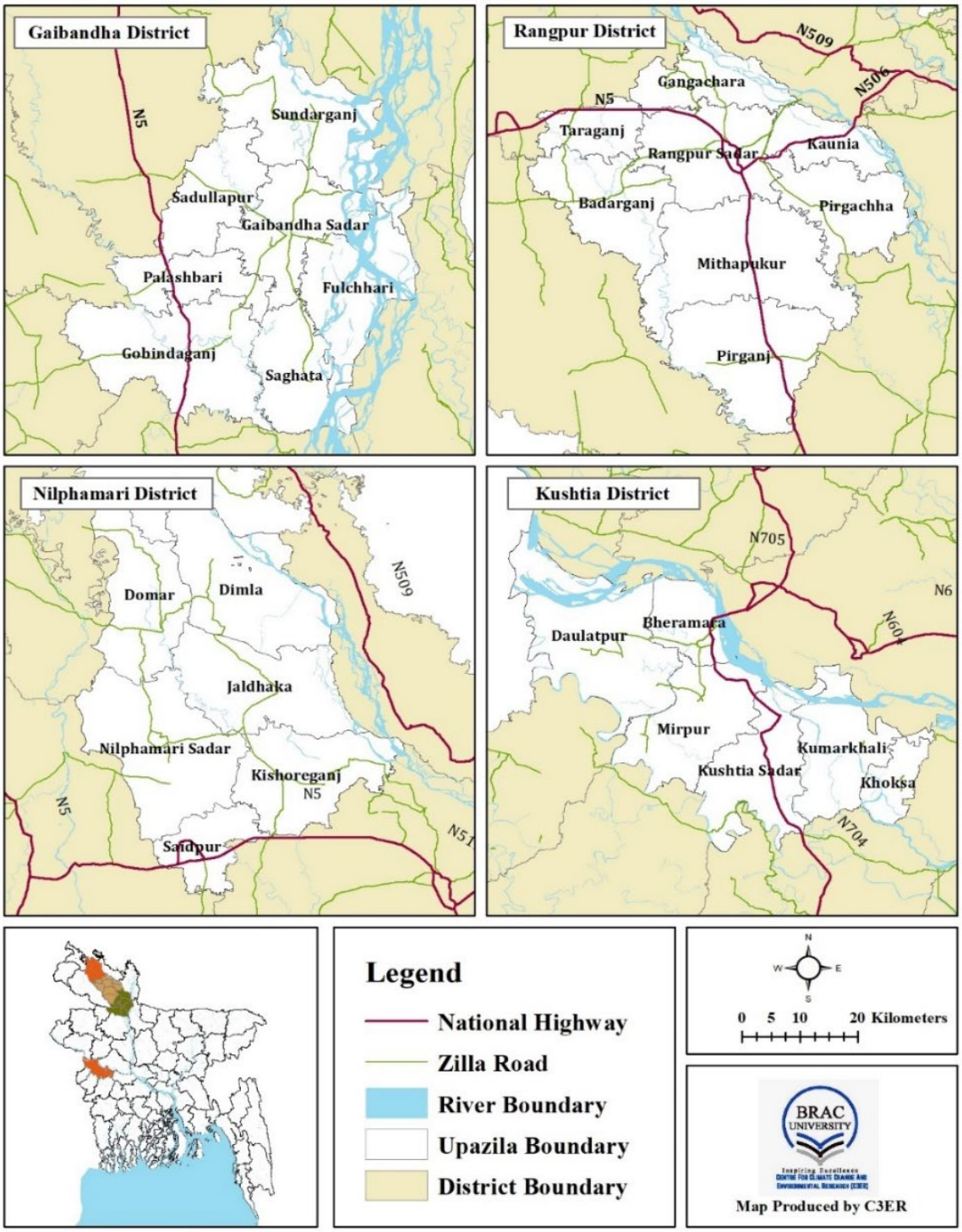

Figure 2a Map representing study areas along with Upazila boundary

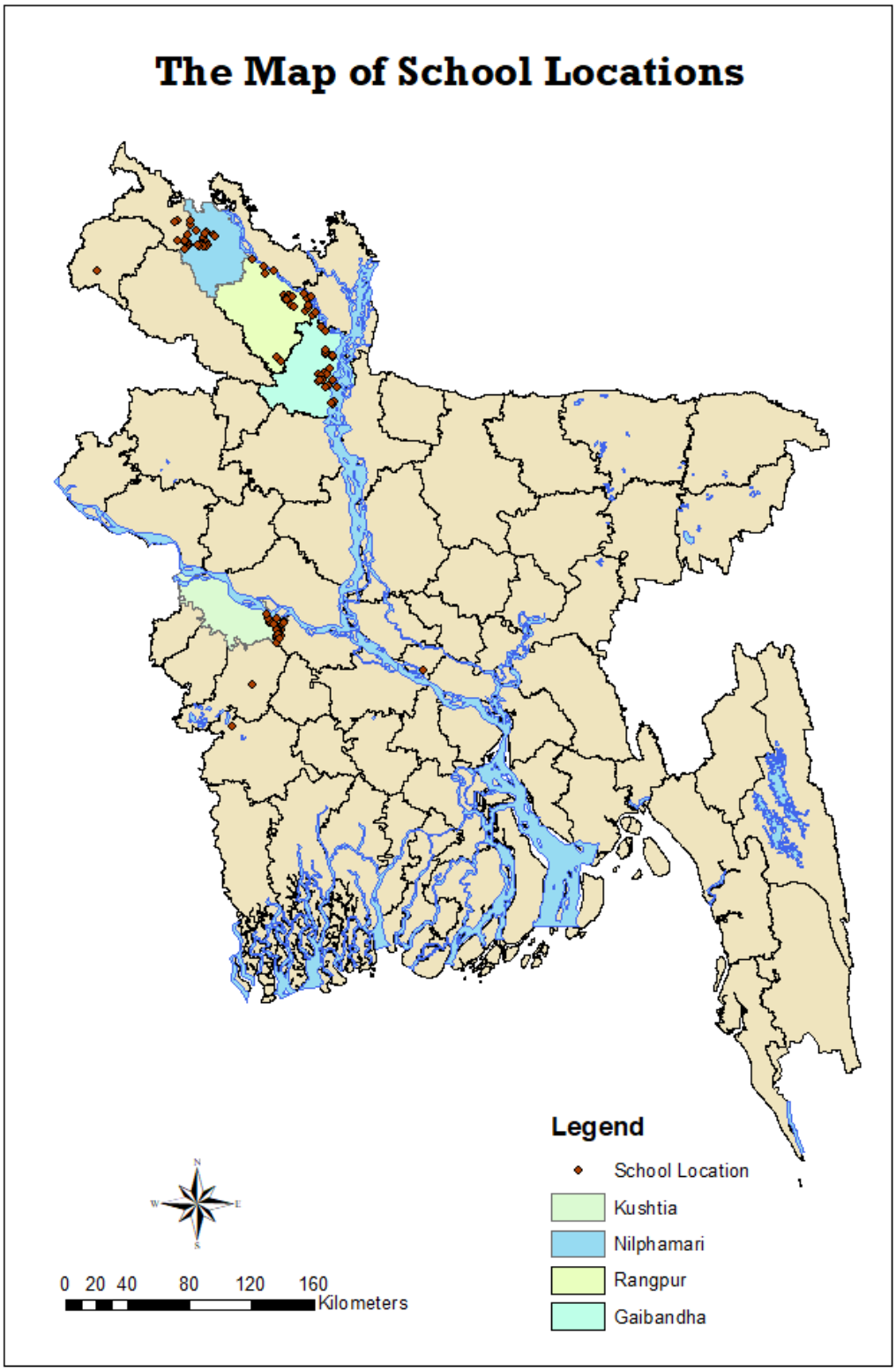

Figure 2b Geographical Location of the schools

4.2 Data Collection from the Study Location

4.2.1 Preparation of Data Collection Tools

Preparing data collection tools is essential in any research or data-gathering process. The study team developed data collection questionnaires and checklists and designed these following the objectives and scope of the activities. For example, the infrastructural need assessment of the schools in terms of disaster preparedness and resilience was carried out using the developed questionnaire and checklists. Moreover, the team has also integrated how disaster affected the schools and communities through the outcome of these questionnaires and checklists. The questionnaire was clear, concise, and coherent so the respondents could easily understand the questions. Both closed-ended and open-ended questions were included in the questionnaire.

4.2.2 Conduct School Survey

In this study, a school survey was conducted to collect quantitative information from the schools on the existing infrastructural condition and repairment needs for disaster preparedness. The study team has ensured the representation of the most vulnerable schools and communities while conducting the school survey. The sample size of the schools was predetermined for infrastructure need assessment. The C3ER team has designed and developed the school survey questionnaire as per the experts' guidance, however, the survey data was collected by the NETZ project team.

4.2.3 Conduct Focus Group Discussion (FGD) Sessions

To verify the information collected through the secondary literature review and school survey, two focus group discussions were conducted in each location. The C3ER team has developed the FGD checklist.

4.2.4 Conduct Key Informant Interview (KII) Sessions

To integrate the actual disaster preparedness and resilience-related information, two key informant interviews were conducted in each location. Moreover, experts' opinions of the KII participants were collected to draw the recommendations points for this study.

4.3 Data Management, Analysis and Reporting

4.3.1 Data Quality Manage and Check

To maintain the data quality, the following actions were taken:

- The field team has conducted spot-checking during the data collection time and reviewed the collected data daily. The feedback was provided to enumerators as and when needed.
- Before analysing the collected data, the C3ER expert team examined data accuracy.

4.3.2 Data Management and Analysis

While conducting the field survey, the raw data were collected using questionnaires and check-lists. After that, SPSS software was used to analyse the collected raw data. Moreover, the analysis result was disaggregated by current infrastructural conditions, disaster preparedness strategies and coping strategies of the schools during disasters in accordance with the research objectives. After cleaning and analysing the collected data, the study team prepared a field report to present the preliminary findings. Then, this report was shared with the NETZ project team for review and comments.

4.3.3 Preparation of Final Report

After the field report, the study team prepared a draft report detailing the findings of the sectoral impacts of disasters, knowledge regarding disaster preparedness, the status of disaster preparedness, the infrastructural need assessment of the schools and strategies for disaster preparedness aiming for improved disaster resilience. Finally, the study team shared the draft report with the expert team for their internal review. Based on their feedback, the team revised the draft report, finalised it and resubmitted accordingly.

5 RESULTS AND FINDINGS

5.1 Sectoral Impacts of Hazards

5.1.1 Impact on Livelihood

The study area confronts many environmental hazards, including high temperatures, drought, floods, cold waves, Nor 'wester and thunderstorms, etc. These adversities significantly impact the community's livelihoods, education, and health.

High temperatures, intensified by minimal rainfall, lead to decreased agricultural productivity, affecting the ability of the community to sustain their livelihoods. Changing rainfall patterns and drought affect the farmer's livelihood. Damaged crops, mainly corn and nuts, result from water scarcity. Groundwater, crucial for irrigation, is affected by erratic rainfall, leading to lowered groundwater table levels.

Floods wash away crops, causing additional damage, while droughts result in the death of fish in ponds, causing losses in fish farming. Floods are commonplace, causing rivers to overflow and inundate the area, damaging crops and reducing yields. Droughts exacerbate this impact, causing river water to dry up and resulting in crop loss and an inability to irrigate fields. Droughts adversely affect their income as individuals often fall ill due to excessive heat while working in the fields. Overall, floods and droughts are the most damaging disasters, followed by thunderstorms and fires.

Cold waves disrupt daily activities, particularly for the vulnerable, such as the elderly and children, hindering work and education. The lack of winter clothes further compounds the suffering. Cold waves harm the crops and vegetables cultivated by farmers. Thunderstorms bring about significant environmental damage, uprooting trees and adversely affecting human lives, housing, and livestock.

Erratic rainfall, high temperatures, flooding and drought, etc. caused extensive damage, leading to frequent migration due to limited employment opportunities. Migration becomes a coping strategy, often driven by the need to repay loans taken out for survival.

5.1.2 Impact on Education

The closure of schools due to prolonged periods of excessively high temperatures, lasting for up to seven days, poses a significant challenge to the education sector. This shift is attributed to the impact of disasters compromising their families' primary sources of income. Additionally, there is a noticeable surge in child marriages, a consequence of the disruption caused by these disasters to the education system. Respondents in the region highlighted the alarming rise in child labour, a trend steadily increasing over time. Children increasingly work various jobs, such as operating vans, to contribute to their families' income.

In the education sector, rising temperatures, heavy rainfall, and floods emerge as significant hazards, impacting both students' attention and teachers' well-being. During high-temperature sea-

sons, respondents noted that load-shedding exacerbates the challenges of staying in the classroom in sweltering weather. The elevated temperatures and drought conditions contribute to health issues among children, including high fever and pox.

Impact on Health

The impact of extreme weather conditions on the community's health, particularly children attending schools and farmers, is pronounced, with cold-borne diseases such as cough, fever, runny nose, asthma, and dysentery affecting school-going children. Farmers facing intense heat also fall ill, and students succumb to fevers and other illnesses arising from various disasters.

The adverse effects of high temperatures and drought on children's health are evident in the health sector, leading to high fever and malnutrition due to rising prices. Heatwaves contribute to health issues, especially among children, leading to fever due to intense sweating. While paracetamol is initially used, the expense of antibiotics becomes a barrier to effective treatment.

Children face challenges accessing adequate healthcare facilities. As a result, they often consult local pharmacists in dispensaries for medication during fevers.

5.2 Current Status of Schools and Community regarding Disaster Preparedness

5.2.1 Status of Knowledge and Awareness Regarding Disaster Preparedness

School Children

The level of disaster awareness among school children is characterised by understanding disaster events and active participation in regular drill sessions. They worry about heat waves and focus on learning about disasters, especially earthquakes. In every Anandalok School, there is one disaster focal person appointed to train the students and teachers on disaster preparedness. As for government schools, efforts have been made to build a sense of responsibility among senior students, who tend to possess more knowledge than their junior fellows. Planting trees at the community level is also an initiative taken by the Anandalok school committee that is an example of teaching about disasters in school.

School Teachers

Among the government school teachers, there is a sufficient lack of knowledge and enthusiasm for disaster response skills. Although teachers talk about planting trees and securing school buildings, teachers should learn more about the cause of damages from different disasters and how to recognize their signs. Teachers of Anandalok schools already received capacity-building training on disaster preparedness. They actively participate in self-preparation, including storing essential items like dry foods and medicines.

School Committees

The School Management Committee (SMC) of Anandalok schools emerges as a key player in disaster awareness and preparedness initiatives, conducting awareness programs, arranging meetings, and actively discussing disaster preparedness before, during, and after disasters. There is

an acknowledgment of the absence of a dedicated school committee tasked with overseeing disaster risk reduction and response planning within government schools.

Government primary schools require a broad and multifaceted approach to disaster preparedness, including student and community awareness, structural safety improvements, and comprehensive relief efforts. They should enhance technological support, provide adequate supplies, and engage in community-wide awareness campaigns. Anandolok Schools should focus on specialized support such as disaster training, infrastructure improvements, and direct aid to affected people. They need to develop clear disaster preparedness strategies and ensure safety through infrastructural repairs and environmental conservation initiatives.

5.2.2 Status of Disaster Preparedness Initiatives of Community and School

5.2.2.1 Community-based Disaster Preparedness Initiatives

Most key informants emphasised the arrangement of workshops and knowledge generation sessions from the projectfocused on disaster preparedness, with a positive note that the community receives financial support from the government for initiatives regarding disaster preparedness.

Disaster preparedness initiatives, such as using irrigation systems during droughts, are undertaken with own funding, lacking support or subsidies from the government or other organisations. Creating water channels during heavy rainfall to reduce the impact and resist flood and waterlogging is another adaptation strategy, with occasional support or subsidies, though deemed inadequate. Indigenous practices involve pumping out excess water from agricultural land, cutting Ailes to drain water, and constructing temporary bamboo bridges for roads submerged for extended periods. Students express concerns about heatwaves and wish to leave school during unbearable weather to reduce the risk of diseases. Therefore, the community calls for more efficient involvement of local government and initiatives from government organisations.

5.2.2.2 School-based Disaster Preparedness Initiatives

a. **Awareness Raising Programs:** The School Management Committee (SMC) plays a crucial role in conducting awareness-raising programs within the school community, integrating this knowledge into student capacity building through the teaching process. Students are taught about disaster preparedness, especially for earthquakes, although the focus is often theoretical with limited practical knowledge. Senior students tend to have more knowledge about preparedness compared to juniors. While drills are connected to disaster preparedness, they do not occur on school premises. Students are trained in providing primary aid for injuries. Awareness-raising programs for students, especially regarding earthquakes and extreme heat, are conducted twice or thrice yearly by the SMC. Meetings with parents are organised 6 to 7 times a year, emphasising the need for active participation from students' mothers.

b. **Tree Plantation:** The school authorities emphasise the importance of planting more trees and taking measures like draining excess water from plantations in response to var-

ying weather conditions. Substantial and flood-protected houses are highlighted as crucial aspects of disaster preparedness.

c. **Providing Aid:** Respondents engage in self-preparation, including storing dry foods and medicines. School Management Committee (SMC) and parental meetings are conducted to discuss disaster preparedness before, during, and after calamitous events. If hazards damage school property, immediate repairs are undertaken to avoid disruptions in school activities. The community also advocates for providing underprivileged students lunch meals and educational items.

d. **Technological System:** Most key informants revealed proactive planning for educational continuity, encompassing alternate locations, schedules, and instructional methods as needed. There is also a robust system in place for securing backup academic records. Regular contact with local news media, including radio, newspapers, and television, is maintained to effectively disseminate planning and emergency messages to families, utilising school-based activities to promote risk reduction on a community-wide scale.

e. **Communication System:** Communication systems for emergencies, including warning mechanisms, have been implemented across the schools, and crucial contact information for emergency response and family reunification has been made readily available.

In the context of disaster risk awareness, school-based activities, projects, and the formal curriculum are influential in providing education at all age levels. Furthermore, staff and students are actively encouraged to prepare for disasters at home, with support materials provided. A notable point of consideration is the consensus among almost all informants that there is a lack of insurance coverage to pool economic risks in the event of disasters. This underscores a potential area for future consideration and action to enhance the overall resilience of educational institutions to unforeseen economic challenges arising from such events. All key informants uniformly reported the absence of a dedicated school committee tasked with overseeing disaster risk reduction and response planning within the schools. Despite this, a noteworthy initiative is regularly conducting drill sessions to educate students about disaster preparedness management, which is effectively integrated into the school curriculum.

5.2.3 Status of Disaster Response Planning of School and Community

According to most respondents, there is a lack of guidelines for post-disaster drills, which include ensuring staff and students participate twice a year. The absence of a buddy system for assistance, annual simulation exercises for response skills, and a focus on continuous improvement from drill outcomes are notable gaps. Moreover, most respondents do not conduct building evacuation drills twice a year, missing the opportunity to practice responses to specific threats their location faces. These include first aid skills for life safety, earthquake procedures like "drop, cover, and hold," water safety for floods, and shelter-in-place procedures for violent threats.

Emphasising and adhering to basic building evacuation rules such as "Don't talk. Don't run. Don't push. Don't go back" during drills and actual emergencies is not commonly practiced according to most respondents. On a positive note, most informants reported having access to dependable

external information sources regarding disasters and an internal communication system. They also conduct practice exercises for receiving updates on emergencies, disseminating warnings to their community, and informing relevant authorities when necessary.

More than half of the informants have sufficient emergency supplies in place for both students and staff to sustain them for at least the first 72 hours following a disaster. This includes essentials like at least 12 litres of water per person, food, first aid supplies, emergency power sources, emergency lighting, alternate communication methods, alternate transportation options, shelter provisions, and sanitation supplies. However, most informants do not have a system in place where students are asked to bring an emergency supplies bag at the beginning of each school year, which they take home again at the end of the year to ensure readiness.

Despite these challenges, most respondents have a standardised organisational system in place and are familiar with the principles for organising post-disaster self-help efforts. They have identified resources for psychosocial support if necessary and have plans in position to utilise their resources for mutual aid and assist the local community's response in times of crisis.

5.3 Need Assessment for Disaster Preparedness at the Schools

5.3.1 Current Condition of the Schools

5.3.1.1 Construction Authorities of the Surveyed Schools

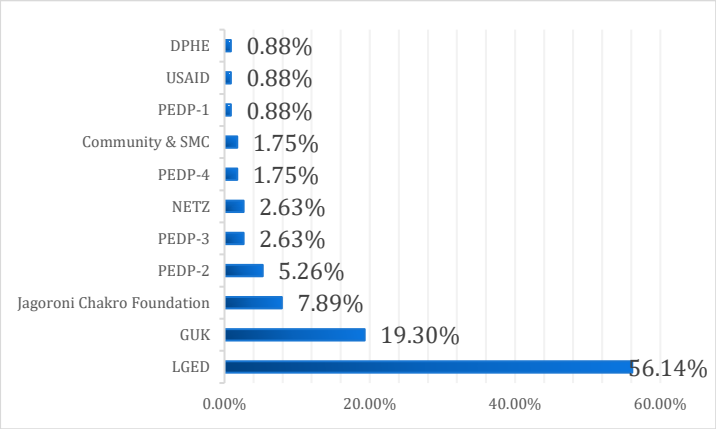

Figure 3 Construction authorities of the surveyed schools

The construction of schools portrays a collaborative effort, with LGED leading at 56.14% and GUK at 19.30%, emphasising their significant roles. Jagorani Chakra Foundation contributes 7.89%, showcasing NGO involvement. PEDP-2 contributed to construct 5.26% of schools. PEDP-3 and NETZ contributed to construct 2.63% of schools individually which are AS schools. Similarly, PEDP-4 and Community & SMC constructed 1.75% of schools individually. PEDP-1, USAID, and DPHE each contribute 0.88%, representing entities with more limited roles. This diverse distribution highlights a cooperative approach involving various stakeholders.

5.3.1.2 Funding Authorities of the Surveyed Schools

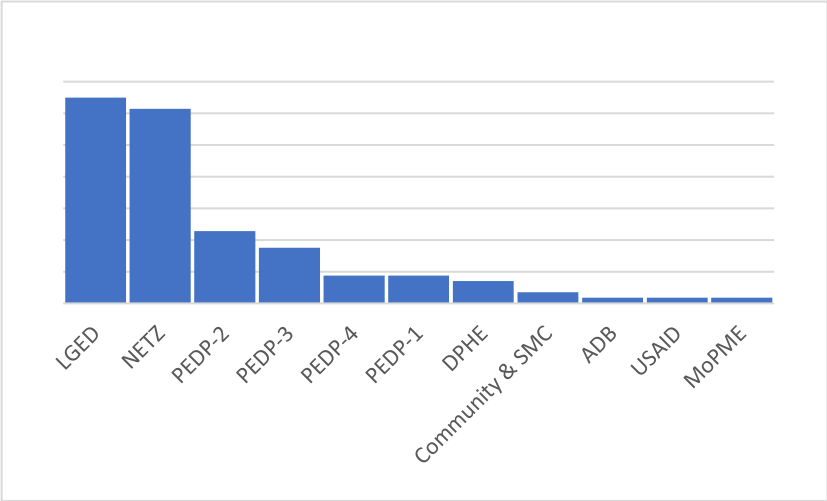

Figure 4 Funding authorities of the surveyed schools

LGED leads funding with 32.46%, emphasising its central role in the construction project. NETZ through BMZ funding closely follows, contributing 30.70%, showcasing a significant financial commitment. PEDP-2 provides 11.40%, adding to the diverse funding sources. PEDP-3 and PEDP-4 contribute 8.77% and 4.39%, respectively, while PEDP-1, DPHE, and Community & SMC collaboratively share a 4.39% contribution. External sources ADB, USAID, and MoPME each contribute 0.88%. This diverse funding distribution underscores the collaborative, multi-stakeholder support for the project.

5.3.1.3 Area of the School (sq km)

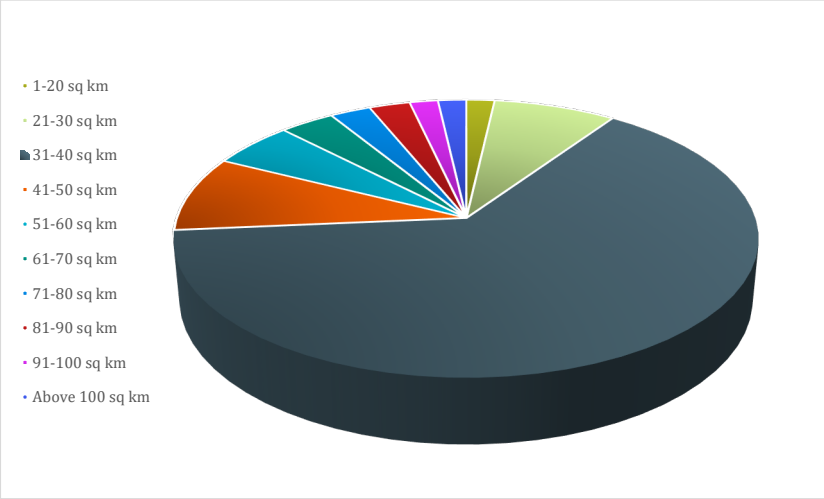

Figure 5 Area of the surveyed schools

Most schools, constituting 64.00%, fall within the 31-40 sq km range, suggesting efficient land use. The 21-30 sq km and 41-50 sq km categories contribute 7.80% and 8.80%, indicating varying land footprints. Schools in the 1-20 sq km and 51-60 sq km ranges represent 1.80% and 5.30%, implying lower prevalence. As areas increase, percentages decrease, with categories 61-100 sq km contributing 3.50%, 2.60%, 2.60%, and 1.80%, respectively. The "Above 100 sq km" category notably maintains a consistent but minor 1.80% representation. This analysis offers insights into the diverse spatial requirements of educational institutions and informs regional planning and infrastructure development.

5.3.1.4 Year of Establishment of the School

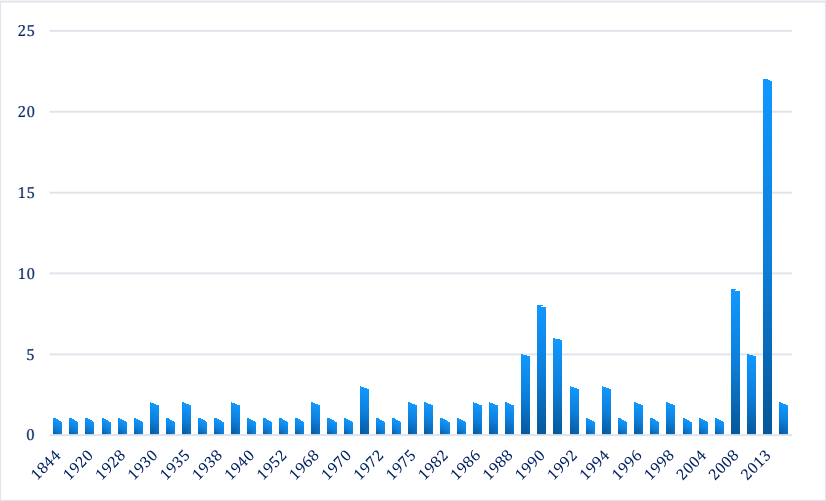

Figure 6 Year of Establishment of the School (In Number)

The data on establishment years reveals diversity across historical periods, from the 19th century to 2021. Noteworthy entries include 1844, 1912, and 1920, reflecting entities with historical roots. The 1970s show increased activity, possibly indicating a period of growth. The 1980s and 1990s maintained a sustained pace, peaking in 1989. The early 2000s demonstrated sporadic establishments, while 2013 marked a significant surge with 22 entities. The data suggests diverse historical contexts and a potentially concentrated initiative period, notably in 2013. This analysis specifies perceptions of entity establishment patterns and trends over time.

5.3.1.5 Year of Construction of the School

The dataset on construction years highlights a diverse distribution, with a notable surge in the late 20th and early 21st centuries. Notably, 2013 stands out with 14 instances, indicative of a concentrated construction period. Elevated rates in 2014 and 2008 (12 and 9 occurrences) and peaks in 1997, 1998, 2001, and 2010 suggest distinct phases of increased development. Historical instances in 1844, 1935, 1968, and 1978 underscore construction's longevity. Recent trends in 2020 and 2021 and a single occurrence in 2023 suggest ongoing efforts. The dataset provides a chronological insight into urban development, revealing patterns and concentrations over time.

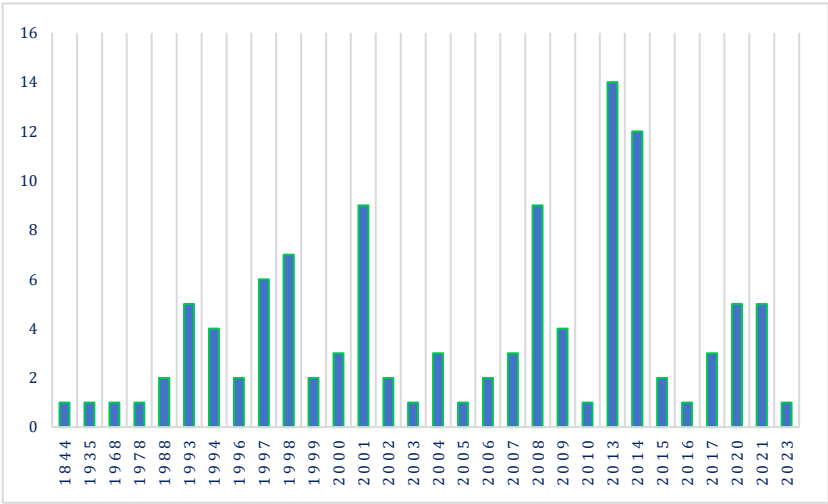

Figure 7 Year of Construction of the School (In Number)

5.3.1.6 Roles of Schools in Responding to Disasters

Approximately 92.10% of schools primarily serve educational functions, highlighting their core role in imparting knowledge. Notably, 4.40% function as "School cum Shelter Home," indicating a dual purpose of education and shelter provision. Another 3.50% are designated as "School and Shelter Home in any needs," reflecting adaptability to diverse community requirements.Out of surveyed 114 schools, 70 GPS and 33 AS are only operating as schools, 5 GPS and 1 AS are serving other purposes such as rearing cows, goat etc, and 5 GPS serve as school cum shelter homes. This dual-role approach showcases schools as community hubs capable of addressing educational needs and contributing to broader community welfare, especially in emergencies. This understanding informs policy decisions, emphasising schools as versatile assets in community development and crisis response.

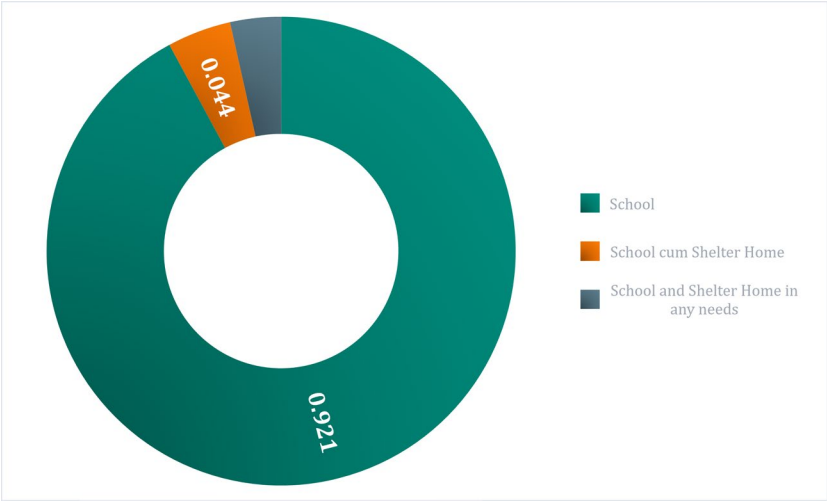

Figure 8 Responding to Disasters

5.3.1.7 Management Authorities of the School

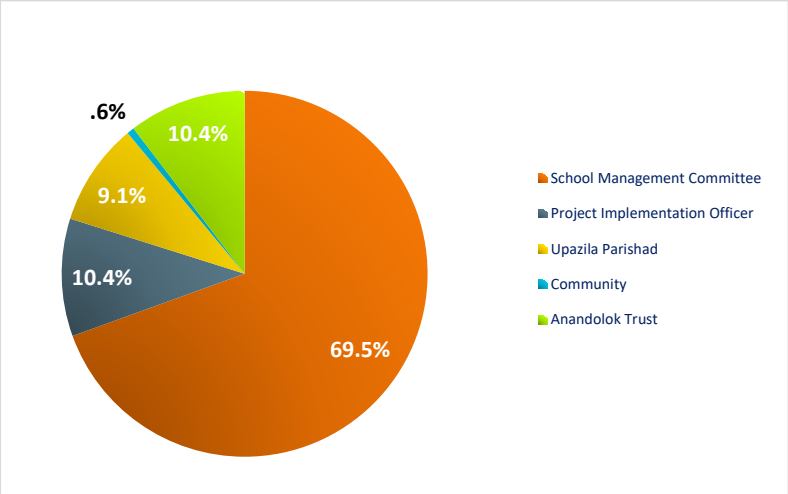

Figure 9 Management Authorities of the School

The schools have diverse management authorities, with local School Management Committees dominating at 69.5%, showcasing community involvement. Project Implementation Officers contribute 10.4%, indicating external influence. Upazila Parishad represents 9.1%, reflecting regional administrative involvement. Surprisingly, community-led administration is minimal at 0.6%, suggesting potential for increased local engagement. Anandalok Trust, at 10.4%, introduces external, non-governmental influence. The data underscores a multifaceted and collaborative educational governance landscape, highlighting the interplay between local committees, external entities, regional bodies, and trusts in shaping and overseeing school functions.

5.3.1.8 Structural Element

In four different districts Gaibandha, Rangpur, Nilphamari and Kushtia, 114 schools have been surveyed for infrastructurl need assessment. Out of 114 schols 80 schools were government primary schools and 34 were Anandolok Trust Schools. The Anandalok Trust Schools were constructed with funding support from NETZ.

As structural elements, column, pillar, wall, ground floor, ceiling, crack or plaster conditions, available ramp facilities of the infrastructures have been assessed. These structures are assessed to state the disaster resilience features of infrastructures. A proper school containing properly fitted doors, windows, pillars and other construction materials ensure structural resilience towards disaster preparedness. However, if the pillars need renovations, cracks in the pillars, dam walls may increase vulnerability of the school infrastructure which cannot be considered fit as a shelter during disasters.

5.3.1.8.1 Column

Reinforced concrete dominates column construction at 87%, highlighting its widespread preference for structural stability. Brick-in-column use is 12%, indicating continued relevance, likely in specific styles or smaller structures. Wood/bamboo column construction is minimal at 1%, reflecting limited application, possibly due to concerns about structural integrity and longevity. This breakdown underscores the prevailing reliance on modern, durable materials like reinforced concrete, with brick serving a significant but secondary role, while traditional materials like wood and bamboo play a marginal role in contemporary column design.

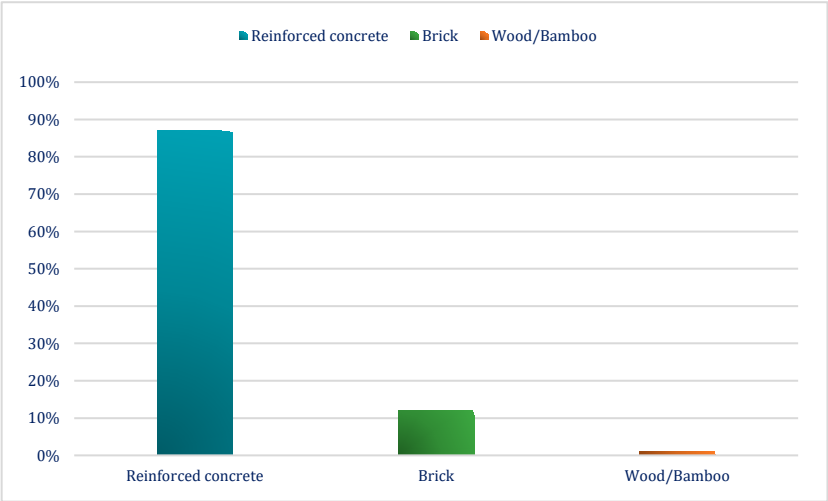

Figure 10 Construction Material for Column

5.3.1.8.2 Pillar

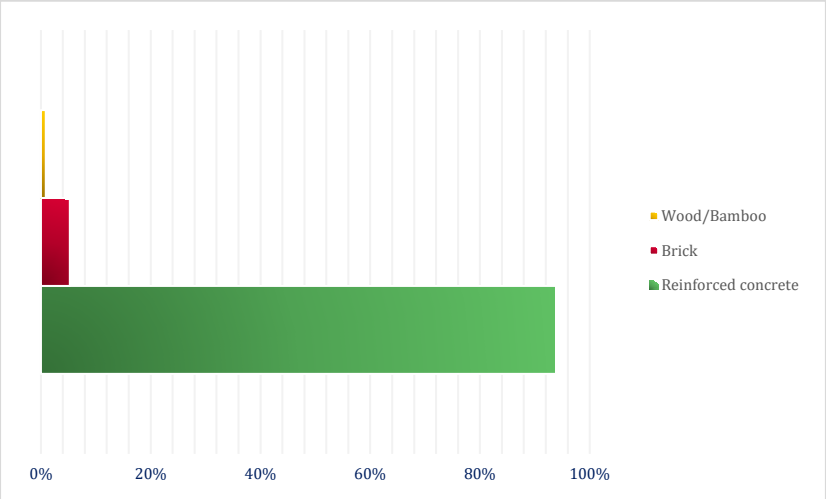

Figure 11 Construction Material for Pillar

Reinforced concrete overwhelmingly dominates pillar construction at 94%, highlighting its widespread preference for strength and versatility. The 5% use of brick suggests continued relevance, likely influenced by aesthetics, regional traditions, or specific structural needs. Wood/bamboo usage is minimal at 1%, indicating limited application due to concerns about load-bearing capacity and environmental factors. This breakdown emphasises the reliance on reinforced concrete in contemporary pillar design, with brick playing a significant but secondary role. At the same time, traditional materials like wood and bamboo have a marginal presence in this construction context.

5.3.1.8.3 Wall

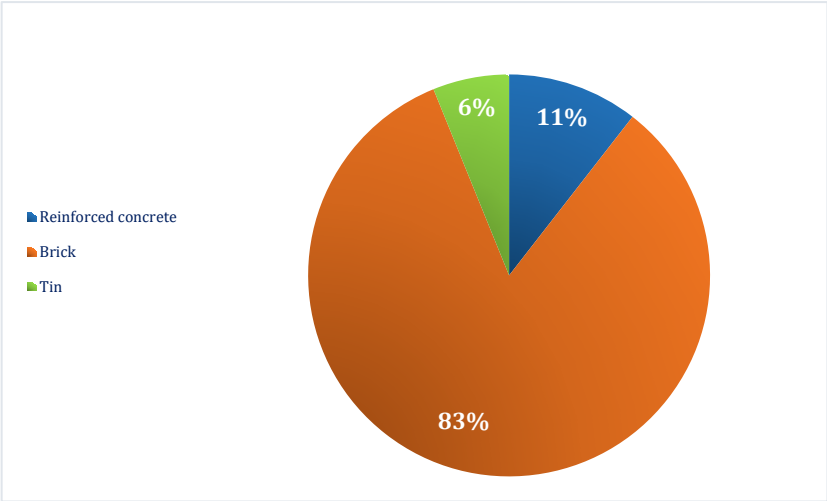

Figure 12 Construction Material for Wall Percent

Brick dominates wall construction at 83%, showcasing its enduring popularity for its versatility and reliability. Reinforced concrete represents 11%, indicating a selective application, likely in situations requiring enhanced strength or specific engineering considerations. The moderate use of tin at 6% suggests a specialised role, potentially in temporary or non-load-bearing structures. The data highlights the diverse landscape of construction materials for walls, with brick as the primary choice for its traditional, durable, and insulating properties, while reinforced concrete is selectively employed, possibly due to structural demands or cost considerations. Tin serves niche purposes within this spectrum of wall construction materials.

5.3.1.8.4 Ground Floor

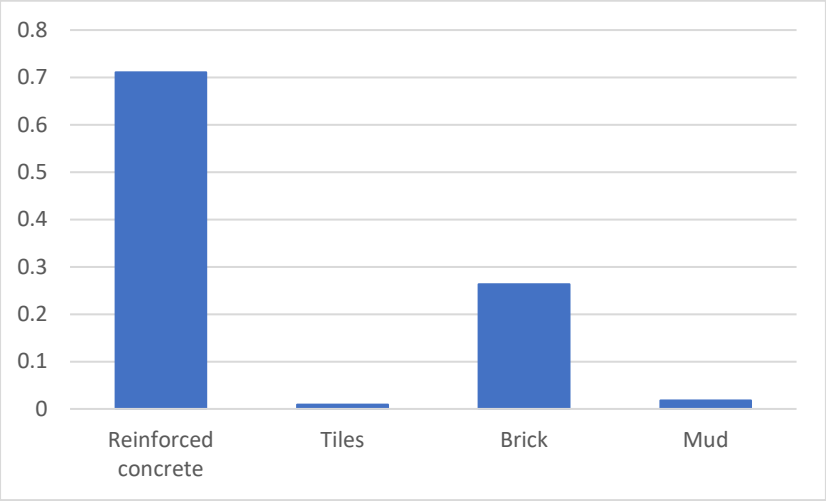

Figure 13 Construction Material for Ground Floor

Reinforced concrete dominates ground floor construction at 71%, reflecting contemporary practices emphasising strength and durability in structural foundations. Brick constitutes a significant 26%, showcasing its versatile application for structural and aesthetic purposes, especially in achieving traditional or distinctive visual character. The minor use of tiles (1%) and mud (2%) adds diversity, with tiles likely contributing to decorative finishes. In contrast, mud suggests potential use in specific architectural contexts for environmental considerations like thermal insulation. The data underscores a varied approach in selecting construction materials for ground floors, with a predominant focus on reinforced concrete complemented by the versatile role of brick and the nuanced use of tiles and mud.

5.3.1.8.5 Ceiling

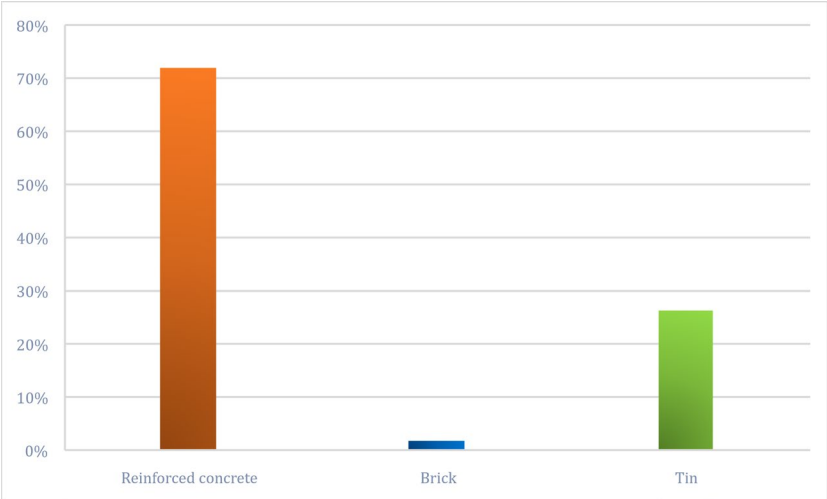

Figure 14 Construction Material for Ceiling

Reinforced concrete dominates ceiling construction at 72%, reflecting its widespread use for structural integrity. Tin holds a significant 26%, indicating a considerable reliance on its lightweight and cost-effective nature, emphasising its versatility in various architectural styles. Brick plays a minor role at 2%, suggesting limited application for specific design or traditional considerations. The data highlights a nuanced material selection for ceilings, where reinforced concrete aligns with contemporary standards, tin offers practical and aesthetic benefits, and brick represents a minor but potentially specialised choice, showcasing a diverse approach in architectural practices.

5.3.1.8.6 Crack or Plaster

The data reveals varying percentages of cracks and plaster issues in different structural elements. Notably, losing plaster on walls is the highest at 20.9%, emphasising challenges in wall maintenance. Losing plaster on floors follows at 16.9%, indicating a significant concern for floor integrity. Cracks in floors at 15.7% underscore potential stability issues. Wall cracks represent 11.6%, urging attention to vertical surfaces. Ceilings, columns, and beams exhibit lower percentages, implying a lesser prevalence of issues. Columns and pillars face a moderate 5.2-5.8% occurrence of plaster problems, while cracks in columns and beams show a relatively lower frequency, suggesting variability in vulnerability.

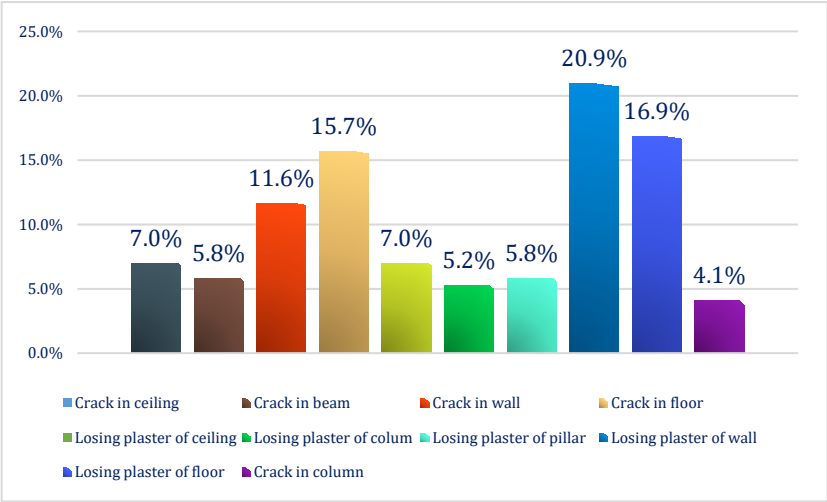

Figure 15 Crack/Plaster status

5.3.1.9 Available Facilities

5.3.1.9.1 Number of Stories

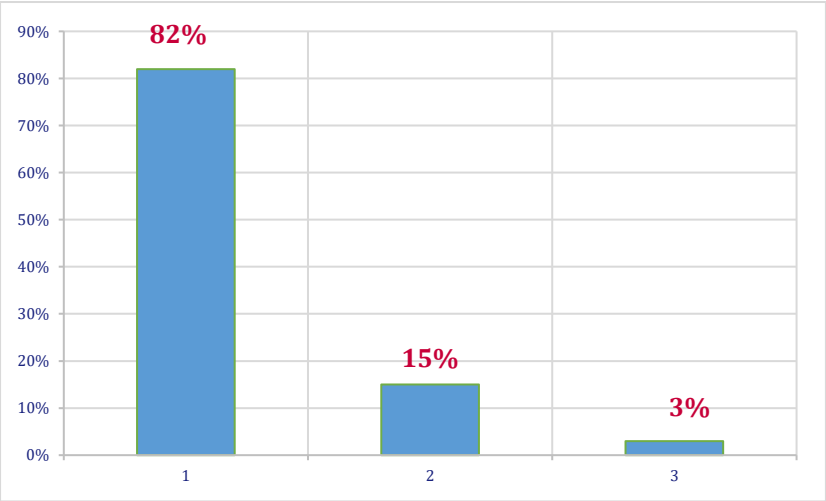

Figure 16 Number of Stories

The data reveals that 82% of surveyed schools have a single floor, suggesting a prevalent trend or adherence to certain design practices. Two-storeyed schools account for 15%, indicating architectural diversity or a response to increased spatial needs. Three-storeyed schools constitute the smallest percentage at 3%, reflecting limited occurrence, possibly due to constraints in the land, construction costs, or regional building regulations. The distribution underscores a dominance of single-storeyed school structures, with two-storeyed schools present but less prevalent and three-storeyed schools being the least common in the surveyed dataset.

5.3.1.9.2 Toilet

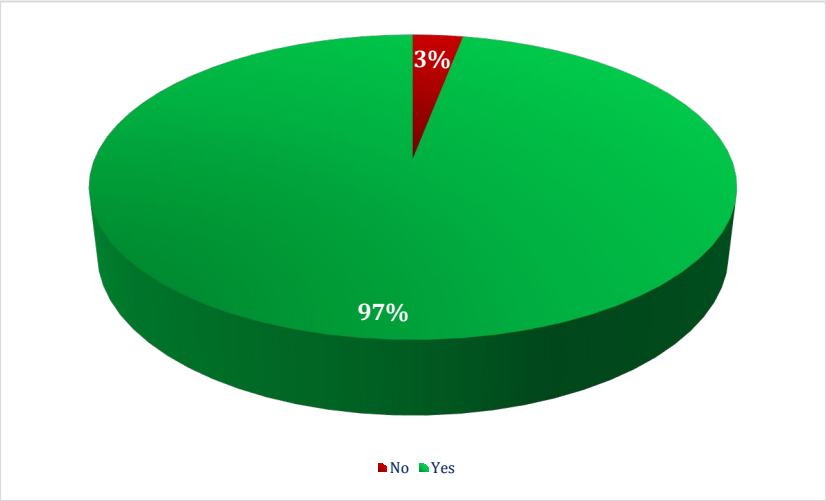

Figure 17 Availability of Toilets

Availability of Toilets: The analysis of surveyed schools reveals positive sanitation infrastructure, with 97% having toilets, aligning with educational standards. However, 3% lack toilets, indicating an infrastructure gap that may impact well-being and learning environments. Addressing the reasons behind the absence, whether due to physical limitations or resource constraints, is crucial for targeted interventions. While the majority have adequate facilities, understanding and addressing the minority without toilets is essential for ensuring a safe and hygienic environment in all schools.

Number of Toilets: The distribution of toilets in surveyed schools reveals that 40% have three toilets, reflecting a common trend in providing moderate sanitary facilities. Additionally, 31% have two toilets, aligning with recognised standards for educational facilities. Notably, 13% have only one toilet, potentially posing challenges for larger institutions. Schools with four or more toilets constitute 17%, showcasing a commitment to ample sanitation infrastructure. The data indicates a gradual decline as the number of toilets increases beyond three, with many schools opting for three to six toilets. This information is vital for future infrastructure planning, ensuring sufficient access for students and staff.

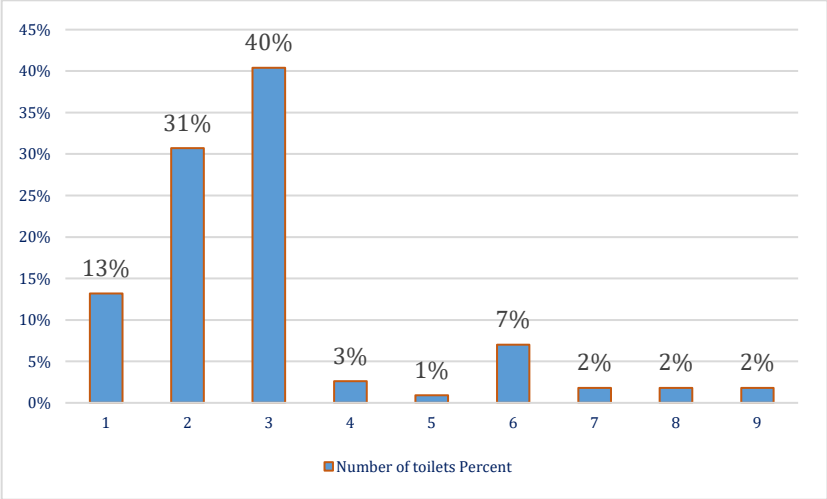

Figure 18 Number of Toilets

Type of Toilets: As per the graph, 78.10% have sanitary latrines with a water seal, indicating a prevalent adoption of advanced and hygienic sanitation technology. Another 14.00% use sanitary latrines without a water seal, reflecting a modern approach with potential implications for odour control. Additionally, 7.90% report using pit latrines, a more traditional and potentially less hygienic form of sanitation. The presence of pit latrines highlights diversity in sanitation facilities, possibly influenced by factors such as geography, resources, or historical development. Understanding these variations informs infrastructure planning and resource allocation for improved sanitary conditions in educational institutions.

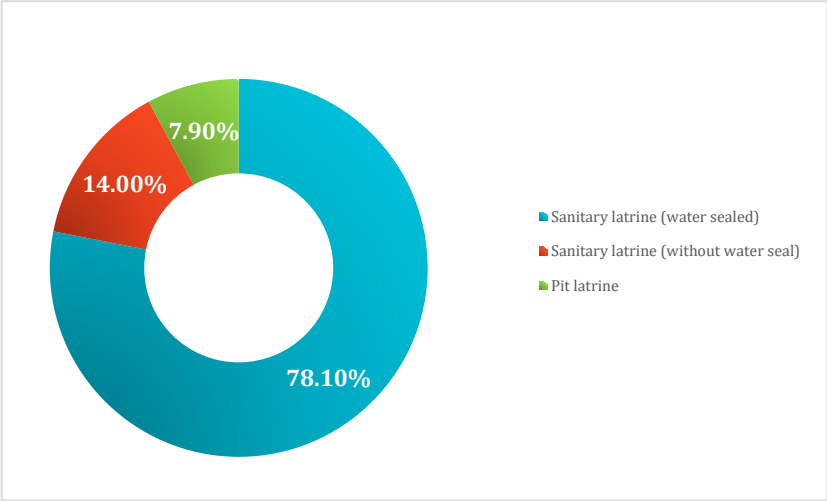

Figure 19 Type of Toilets

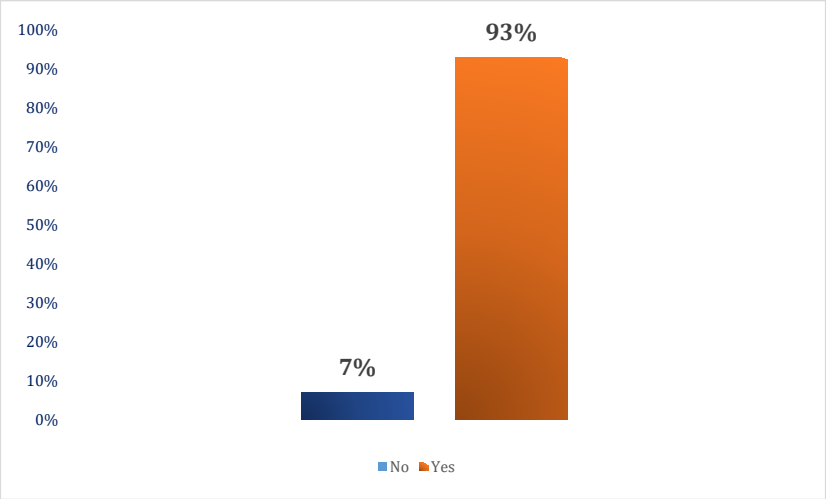

Figure 20 Available Water Supply in Toilets

Available Water Supply in Toilets: In the study area, 93% of schools have water supply in toilets that aligns with hygiene standards. However, 7% lack water supply, raising concerns about sanitation adequacy in some institutions. The absence may impact cleanliness and well-being. Investigating this gap is crucial for targeted interventions. The data highlights a positive trend in most schools but underscores the need to address the minority lacking essential water supply for proper sanitation. This awareness informs potential improvement strategies, ensuring all schools can provide a hygienic environment for their educational communities.

Moreover, the statistical evidence of schools reveals a positive trend, with 65% having designated toilets for girls, reflecting attention to gender-specific needs and promoting inclusivity. However, 35% lack such facilities, raising concerns about adequacy and potential impacts on female students' well-being. Investigating reasons for this absence is crucial for targeted interventions. The data highlights the importance of ongoing efforts to ensure inclusivity and gender-sensitive infrastructure in education. While most schools recognise gender-specific needs, the percentage without such facilities emphasises the need for continuous improvement, guiding strategies to provide diverse and supportive facilities for all students.

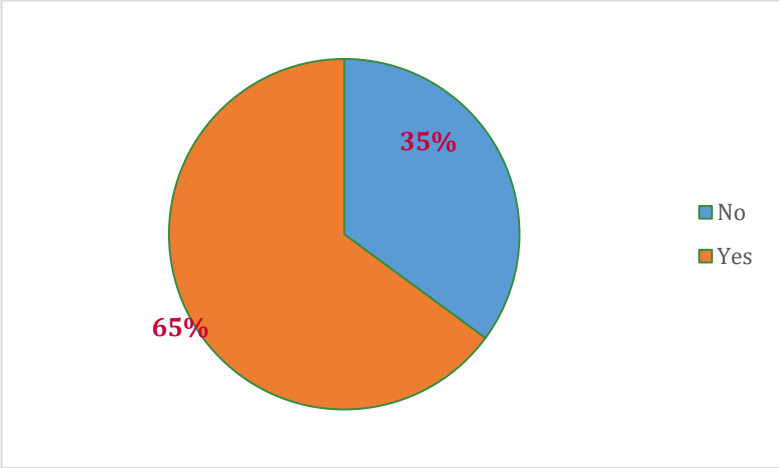

Figure 21 Toilet Facilities Available for Girls

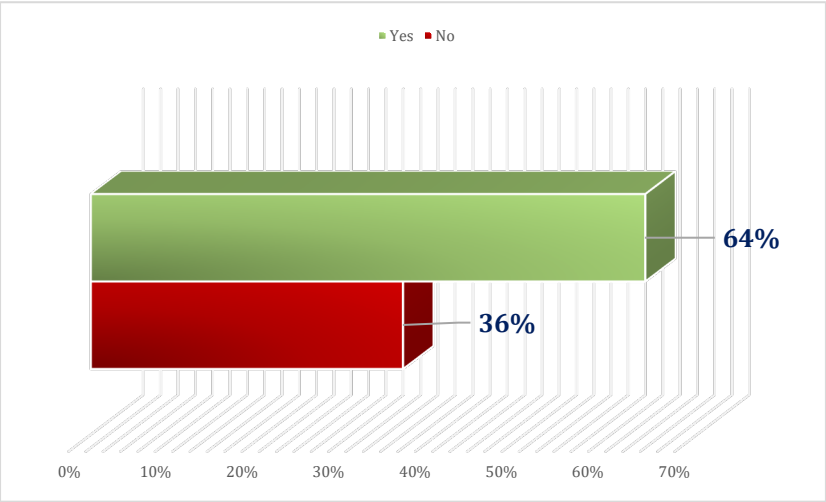

Figure 22 Handwashing Facilities

Additionally, 64% have handwashing facilities in their toilets, reflecting a commendable effort to prioritise hygiene standards. However, 36% lack such facilities, raising concerns about promoting effective hand hygiene practices. Access to handwashing is crucial for preventing infections, especially in communal settings like schools. Investigating the reasons for this absence is essential for targeted interventions. While most are committed to hygiene, the significant percentage without handwash facilities underscores the ongoing need to ensure access to basic sanitary amenities. This understanding informs potential strategies for improvement, prioritising the health and well-being of educational communities.

5.3.1.9.3 Source of Electricity

The analysis of electricity sources in surveyed schools reveals that 83.4% rely on the Rural Electrification Board (REB), indicating a widespread connection to the national grid. Additionally, 14.0% source electricity from regional providers like NESCO/WZPDC/PDB, showcasing diversity in power sources. A noteworthy 2.6% utilise solar energy, reflecting a growing trend toward sustainable practices. This data underscores the conventional reliance on the national grid. At the same time, including regional providers and solar energy highlights a nuanced approach, emphasising both traditional and environmentally friendly energy solutions in the surveyed educational institutions.

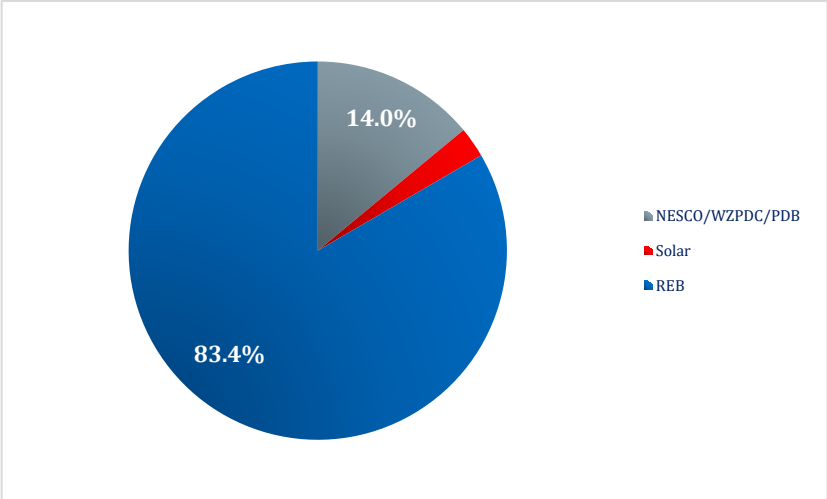

Figure 23 Source of Electricity

5.3.1.9.4 Available Water Source

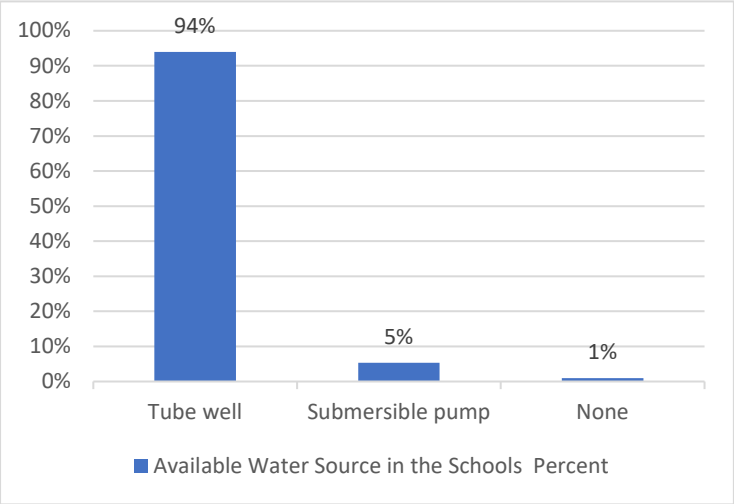

Figure 24 Available Water Source

Available Water Source in the Schools: The analysis of water sources in surveyed schools reveals that 94% rely on tube wells, showcasing a prevalent groundwater use. In contrast, 5% employ submersible pumps, reflecting a technological diversity in water access solutions. Notably, 1% of schools report having no available water source, raising concerns about the adequacy of water infrastructure. This data emphasises the widespread reliance on traditional tube wells, the adoption of submersible pumps for some institutions and highlights the critical need for water access in educational settings, with potential implications for hygiene and daily activities.

Available Drinking Water Source: In surveyed schools, 97% depend on tube wells for drinking water, indicating a prevalent reliance on groundwater. In contrast, 3% use submersible pumps, showcasing a minor but diverse technological approach. The overwhelming use of tube wells underscores their established role in providing safe drinking water in various regions. Meanwhile, including submersible pumps reveals a nuanced approach in a subset of schools, highlighting diversity in water access solutions for ensuring potable water.

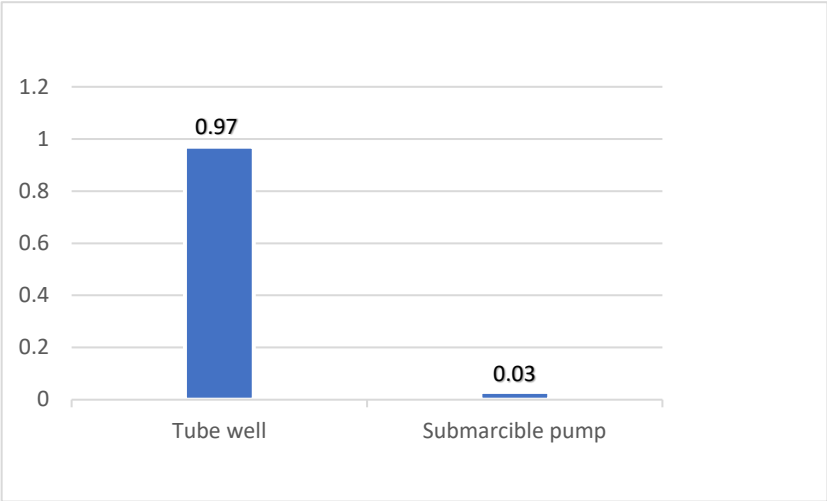

Figure 25 Available Drinking Water Source

5.3.1.9.5 Window Construction Materials

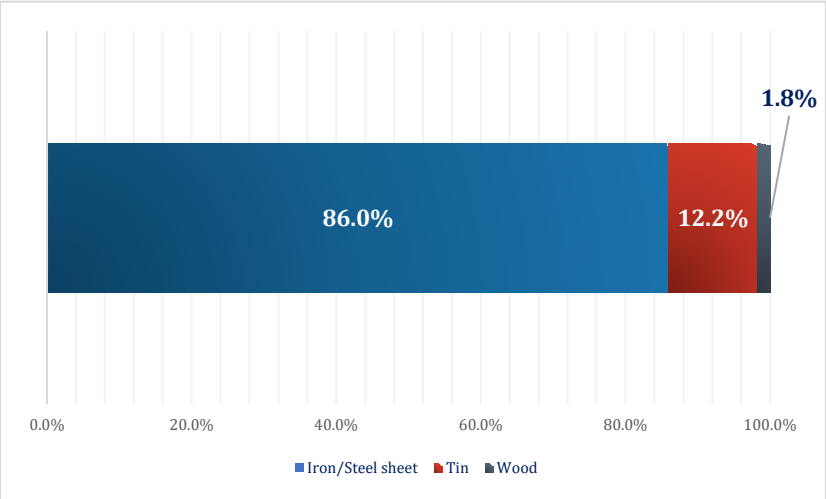

Figure 26 Window Construction Materials

In surveyed schools, 86% predominantly use iron/steel sheets for window construction, emphasising durability and cost-effectiveness. The data reveals a more minor but notable use of tin (12.2%), showcasing diversity in window materials, possibly chosen for lightweight and corrosion-resistant characteristics. Conversely, a minimal 1.8% use of wood reflects a modern trend favouring materials with greater longevity and resilience while potentially eschewing traditional options prone to decay or maintenance challenges.

5.3.1.9.6 Door Construction Materials

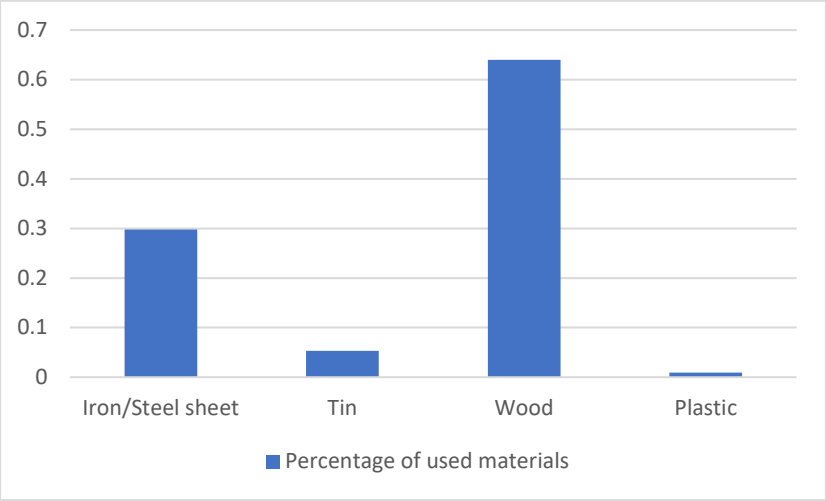

Figure 27 Door Construction Materials

In surveyed schools, 64.0% use wood for doors, reflecting a preference for traditional, versatile, and aesthetically appealing materials. Additionally, 29.8% opt for iron/steel sheets, prioritising strength and security. A smaller but diverse 5.3% use tin, indicating choices based on lightweight and corrosion-resistant properties. Notably, 0.9% employ plastic doors, showcasing a modern and cost-effective approach emphasising ease of maintenance and environmental resistance. This data illustrates a nuanced selection of door materials, considering factors like tradition, security, versatility, and modernity in educational infrastructure.

5.3.1.9.7 Waste Management System

Figure 28 Waste Management System

In surveyed schools, 42.1% use incineration for waste disposal, indicating a prevalent strategy to manage waste volume and environmental impact. However, 21.1% of store waste is on-site, suggesting improved waste management infrastructure is needed. Dustbin usage is at 13.2%, indicating a common but potentially underutilised approach for waste segregation. Burying waste is reported by 1.8%, raising concerns about environmental and health implications. Notably, 21.8% did not respond, signalling potential gaps in waste management awareness or practices and highlighting an area for targeted support and education on effective waste management.

5.3.1.9.8 Available Storage Facilities for Valuables

The majority (96.5%) of surveyed schools have storage facilities for valuables, showcasing a proactive commitment to security. However, a minimal percentage (3.5%) lacking such facilities raises concerns about potential security gaps in a subset of schools. Understanding the reasons behind the absence of storage facilities is crucial for targeted interventions to enhance security measures.

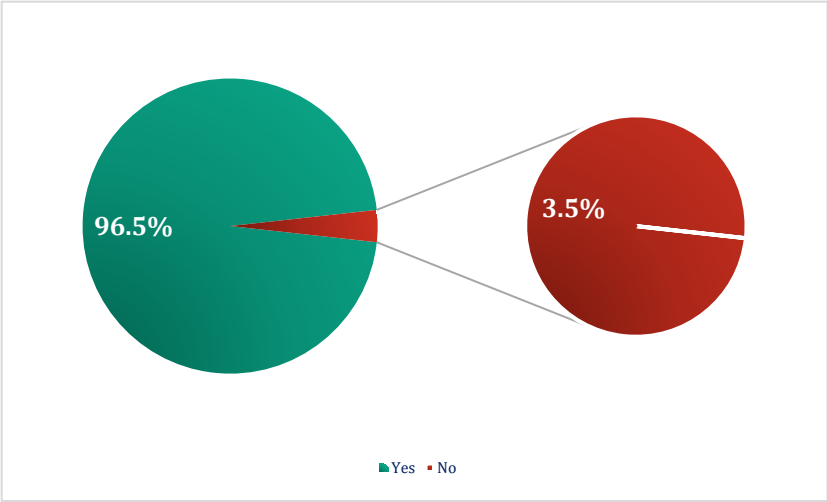

Figure 29 Available Storage Facilities for Valuables

5.3.1.9.9 Ventilation Facilities

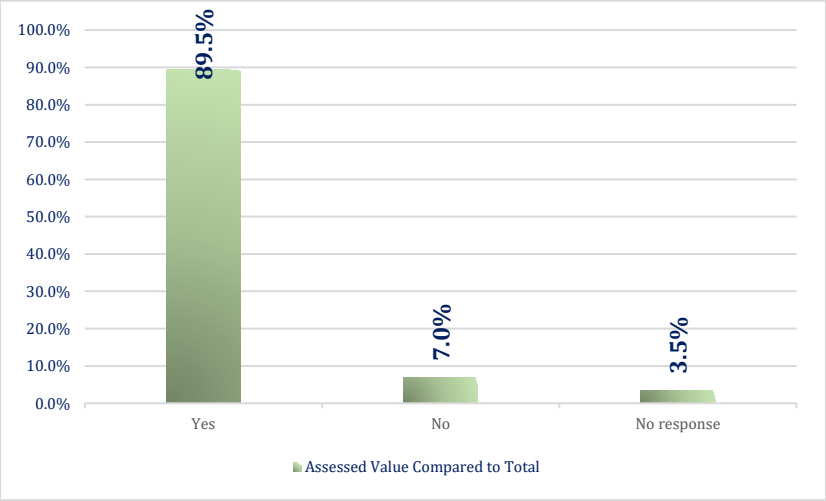

Figure 30 Ventilation Facilities

Most surveyed schools (89.5%) have ventilation facilities, reflecting a widespread commitment to indoor air quality. However, 7.0% lack such facilities, raising concerns about air circulation in some schools. Recognising the causes behind this absence is crucial for targeted interventions. Additionally, 3.5% didn't respond, suggesting potential gaps in awareness or policies related to ventilation, highlighting an area for targeted support or education on the importance of proper air circulation in educational environments.

5.3.1.9.10 Ramp Facilities Available for Persons with Disabilities

Approximately half of the surveyed schools (49.1%) have ramp facilities, indicating a recognition of the importance of accessibility for individuals with disabilities. However, 47.4% lack such facilities, highlighting a substantial portion without measures for easy access. Understanding the causes behind this lack is crucial for targeted interventions. Additionally, 3.5% didn't respond, suggesting potential gaps in awareness or policies related to accessibility, emphasising a need for education and support in creating inclusive infrastructure for persons with disabilities.

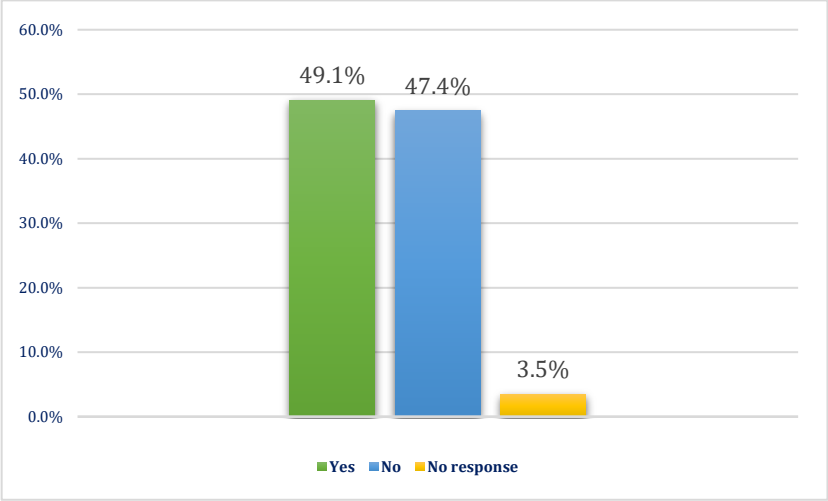

Figure 31 Ramp Facilities Available for Person with Disabilities

5.3.1.9.11 Availability of Railing in Ramp Facilities

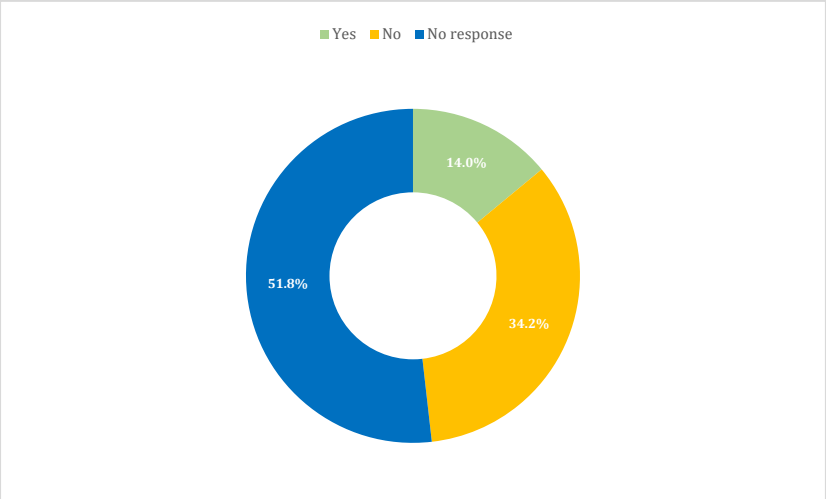

Figure 32 Availability of Railing in Ramp Facilities

A minority of surveyed schools (14.0%) have railings in their ramp facilities, indicating a potential gap in comprehensive accessibility infrastructure for persons with disabilities. Conversely, a significant proportion (34.2%) lacks railings, raising concerns about safety standards for individuals with mobility challenges. Most schools (51.8%) did not respond, suggesting an information gap or potential lack of awareness about the specific features in infrastructure for persons with disabilities. Addressing this gap is crucial for ensuring schools implement inclusive measures and contribute to creating a safe and accessible learning environment.

5.3.1.9.12 Ramp Construction Materials

Reinforced concrete is the predominant material for ramp construction in surveyed schools (36.8%), emphasising durability. A smaller percentage (7.9%) uses brick, indicating a potentially cost-effective approach. Minimal usage of wood/bamboo (0.9%) reflects a modern trend favouring longevity. Remarkably, most schools (54.4%) did not respond, suggesting an information gap regarding the materials used for ramp construction. Addressing this gap is crucial for documenting and understanding schools' diverse approaches to creating accessible infrastructure for persons with disabilities.

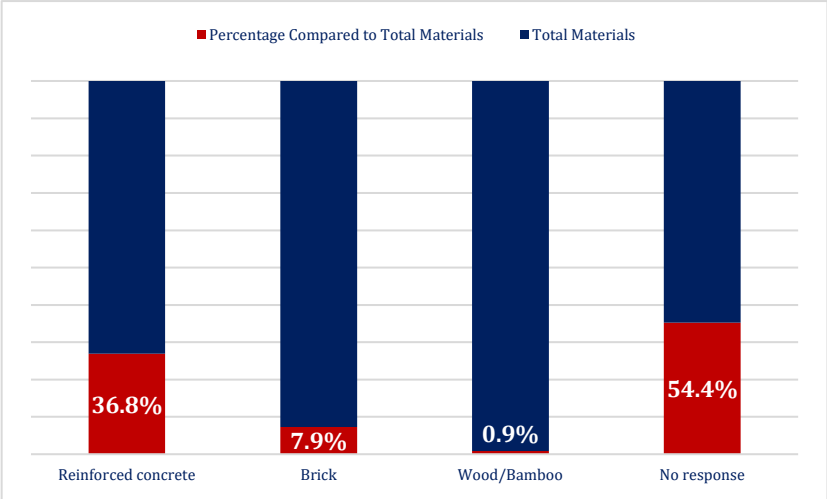

Figure 33 Ramp Construction Materials

5.3.1.9.13 Stair Facilities

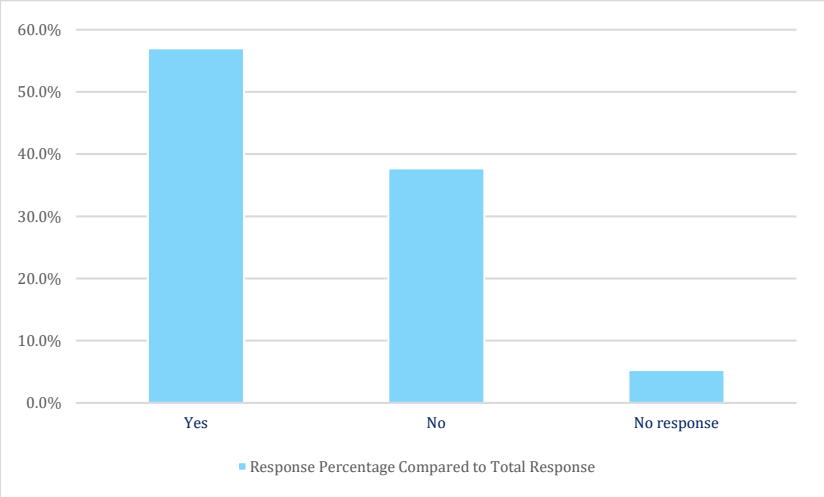

Figure 34 Availability of Stair Facilities

Availability of Stair Facilities: In surveyed entities, 57.0% have stairs, highlighting their prevalent inclusion for vertical mobility. Conversely, 37.7% lack stair facilities, suggesting diverse architectural choices, code adherence, or alternative accessibility features. A small percentage (5.3%) did not respond, indicating a potential information gap on the specific features of surveyed entities' infrastructure. Addressing this gap is crucial for understanding entities' varied approaches to providing vertical access within their facilities.

Availability of Railing in Stairs: In surveyed entities, 18.4% have railings in stairs, emphasising safety and accessibility. Conversely, 36.9% lack stair railings, potentially impacting safety. A substantial majority (44.7%) did not respond, revealing a potential information gap on safety features in surveyed entities' infrastructure. Addressing this gap is vital for understanding and improving facility safety measures.

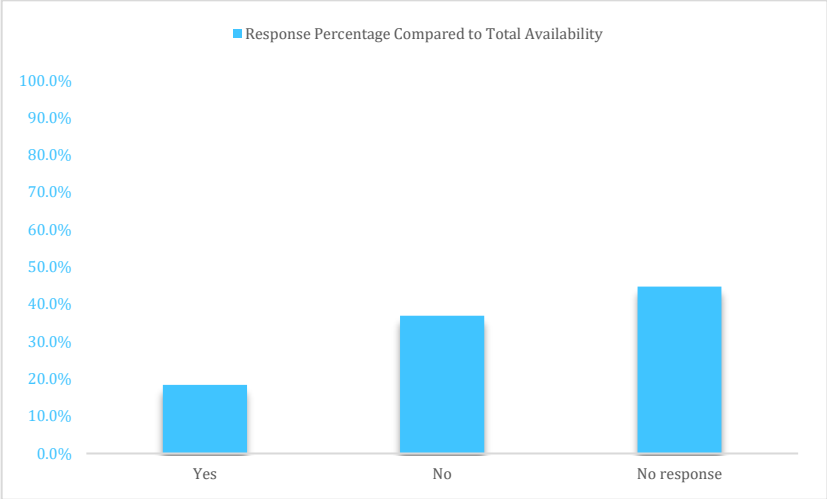

Figure 35 Railing Availability in Stairs

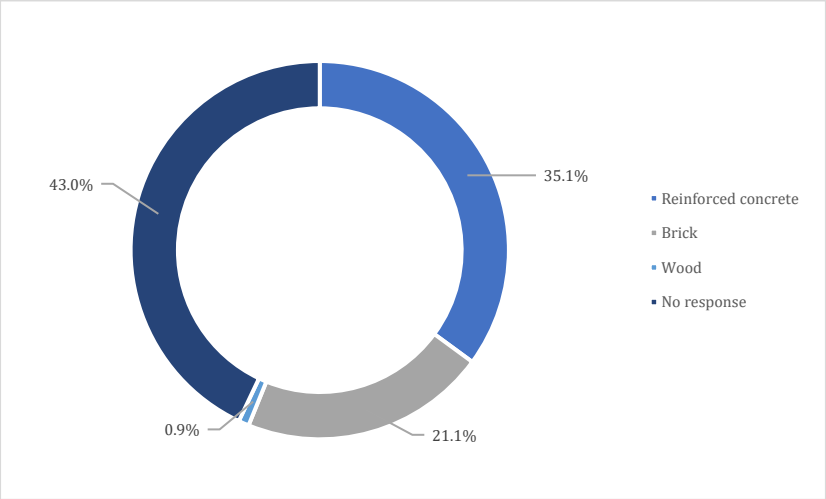

Figure 36 Stair Construction Materials

Construction Materials of Stairs: Reinforced concrete is the primary material for stair construction in 35.1% of surveyed entities, emphasising durability. Brick, at 21.1%, represents a cost-effective alternative. Wood, at 0.9%, indicates intentional use for aesthetic reasons. A significant majority (43.0%) did not respond, revealing an information gap on stair construction materials in the surveyed entities. Addressing this gap is crucial for understanding construction choices and ensuring the longevity of staircases.

5.3.1.9.14 Building Protection

Building Protected by Boundary: Most (86.0%) surveyed entities lack protective boundaries, potentially impacting security and access control. In contrast, a minority (14.0%) prioritise security by implementing physical barriers around their buildings, such as fences or walls. This finding underscores the varied approaches to security measures, with a notable proportion opting for protective boundaries to enhance overall safety and access control within the surveyed entities.

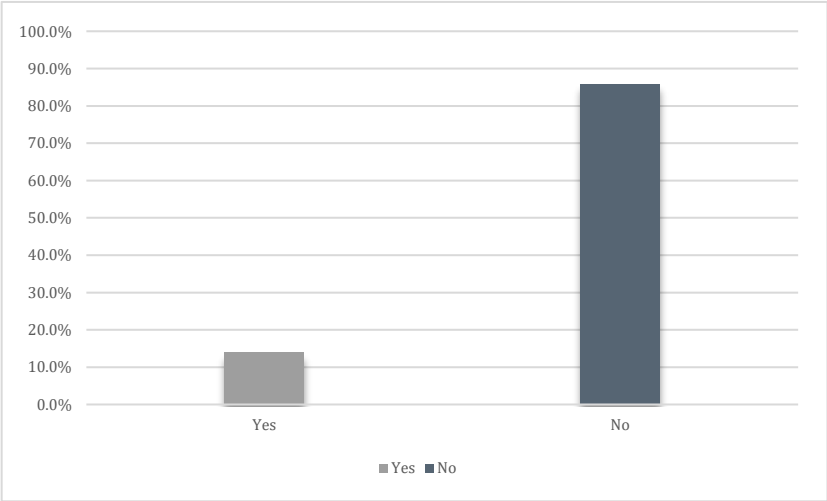

Figure 37 Building Protected by Boundary

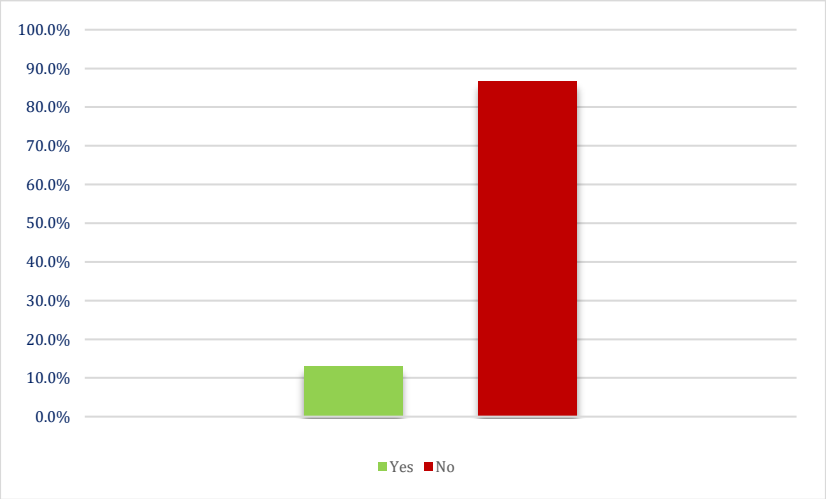

Figure 38 Building Protected by Gate

Building Protected by Gate: Most surveyed entities (86.8%) lack protective gates around their buildings, potentially impacting access control and security. Conversely, a minority (13.2%) prioritise security by implementing gates, enhancing control over access points and serving as a deterrent to unauthorised entry. This finding highlights the diverse approaches to security measures within the surveyed entities, with a notable proportion choosing gated access to bolster overall building security.

Building Protected by Fence: A substantial percentage of surveyed entities (53.5%) prioritise security by implementing protective fences around buildings, contributing to access control and overall safety. Conversely, a noteworthy portion (38.6%) opts for alternative security measures or chooses not to employ a fence. The absence of fencing may result from architectural considerations, local regulations, or other factors influencing security decisions. A smaller but significant percentage (7.9%) did not respond, highlighting a potential information gap or a need for increased documentation regarding specific security features in the surveyed entities' infrastructure.

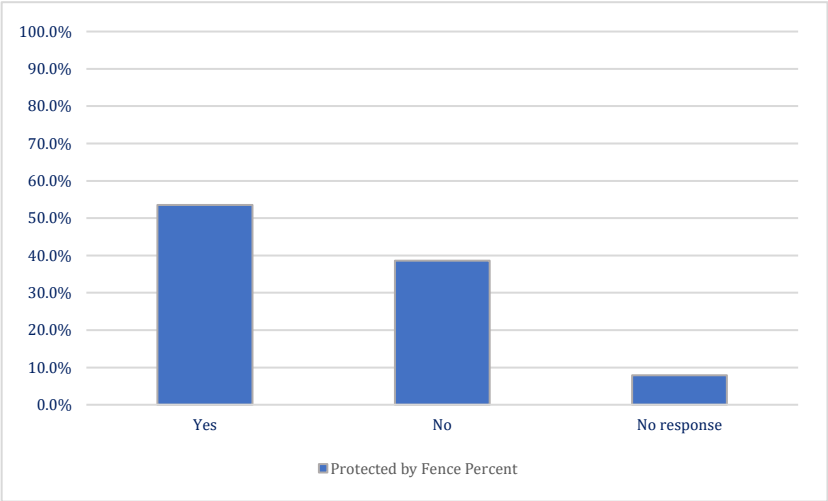

Figure 39 Building Protected by Fence

5.3.1.9.15 Plantation Status

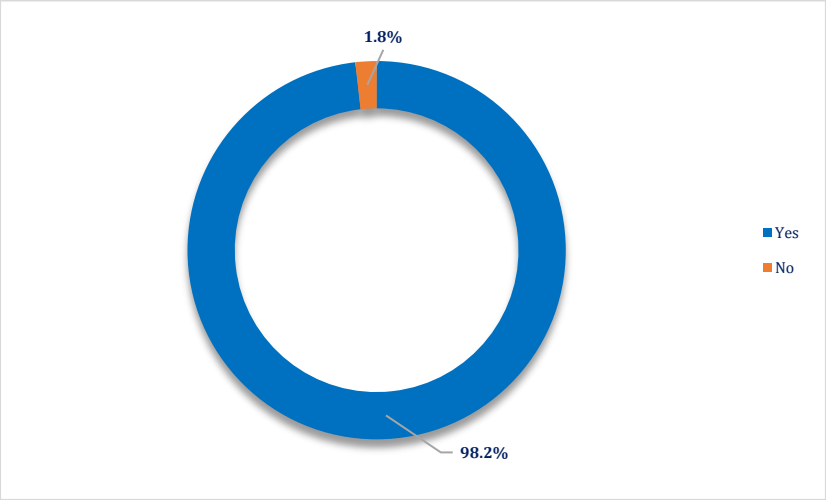

Figure 40 Plantation Status

Plantation Status: A remarkable 98.2% of surveyed entities demonstrate a solid commitment to green initiatives, actively engaging in plantation efforts for ecological balance, aesthetic enhancement, and overall well-being. This high percentage signifies widespread acknowledgement of the importance of afforestation. In contrast, a minimal 1.8% of entities do not have plantation initiatives, possibly influenced by space constraints, urban settings, or other contextual considerations. While a small percentage, it underscores a subset of entities that may not prioritise or have yet to implement greening efforts on their premises.

Plantation Status of Fruit Tree: The analysis of fruit plantations in surveyed entities reveals a diverse landscape. Mango dominates at 33.1%, reflecting its broad appeal and economic significance. Jackfruit follows at 24.5%, indicating recognition of its value and potential contribution to food security. Guava, at 7.4%, adds nutritional diversity. Lychee, Plum, and Olive collectively make up 16.9%, showcasing varied choices influenced by climate and demand. Coconut, at 3.9%, indicates regional selectivity. The "Others" category, constituting 14.0%, underscores the richness of local fruit choices, emphasising agriculture's adaptability to preferences and conditions. This diverse fruit landscape signifies a nuanced approach to agricultural practices.

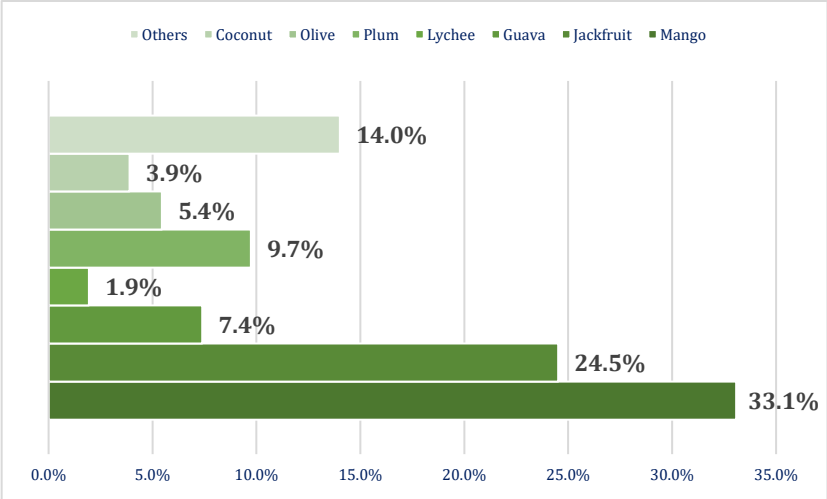

Figure 41 Fruit Tree Plantation

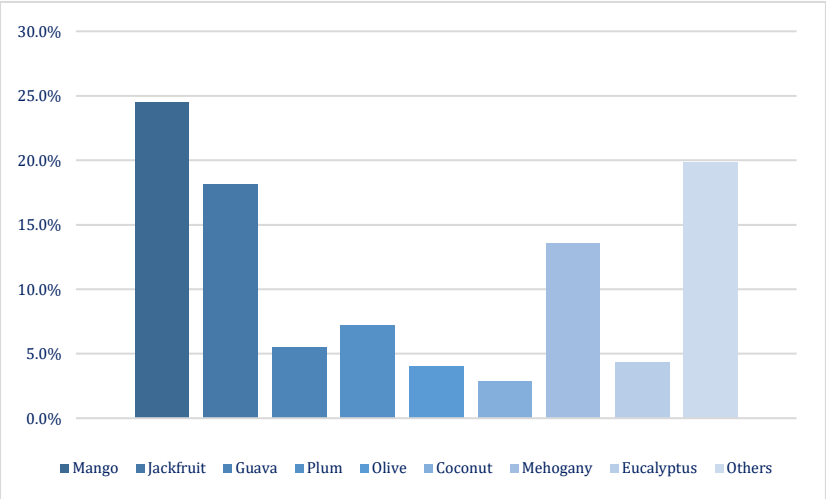

Figure 42 Types of Tree Plantation

Types of Tree Plantation: The surveyed entities exhibit a diverse range of vegetation choices. Mango leads at 24.5%, reflecting its economic, nutritional, and cultural significance. Jackfruit follows closely at 18.2%, emphasising its substantial presence and versatility. Guava, plums, and olives contribute to botanical diversity at 5.5%, 7.2%, and 4.0%, respectively, providing varied flavours and nutritional benefits. Coconut cultivation at 2.9% suggests a selective approach, considering climate and local demand. At 13.5% and 4.3%, Mahogany and Eucalyptus represent hardwood species integrated for commercial and industrial applications. The "Others" category, at 19.9%, underscores the richness of vegetation choices, reflecting adaptability to local conditions and community needs.

5.3.1.9.16 Number of Rooms for Utilisation

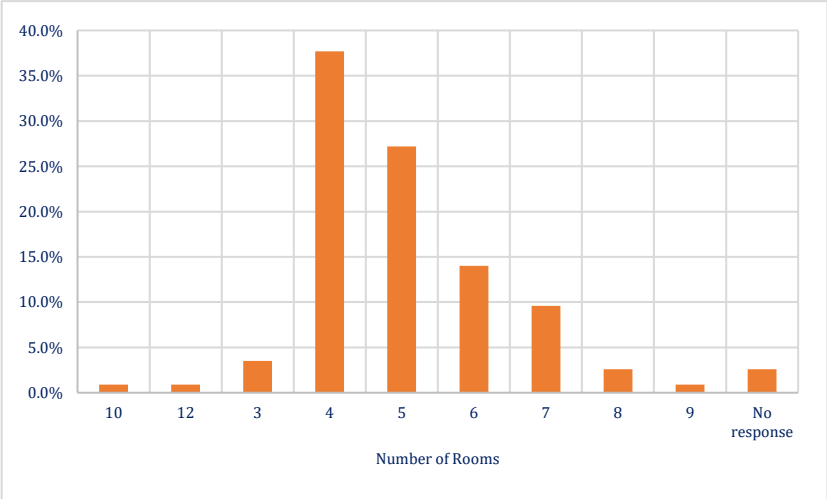

Figure 43 Number of Rooms for Utilisation

The surveyed entities exhibit diverse spatial configurations. Notably, 37.7% have four rooms, showcasing a prevalent and strategic space allocation. Five rooms in 27.2% of entities emphasise adaptability to moderate-sized facilities. Entities with six rooms (14.0%) suggest slightly larger spatial capacities, accommodating a broader range of activities. Seven rooms (9.6%) indicate a distinct spatial organisation for compelling operational needs. Entities with eight, nine, ten, and twelve rooms (0.9% to 2.6%) highlight individuality in spatial planning. However, 2.6% did not respond, indicating a potential information gap or a need for increased documentation about the surveyed entities' infrastructure.

5.3.1.9.17 Construction Material of Rooms in the School Building

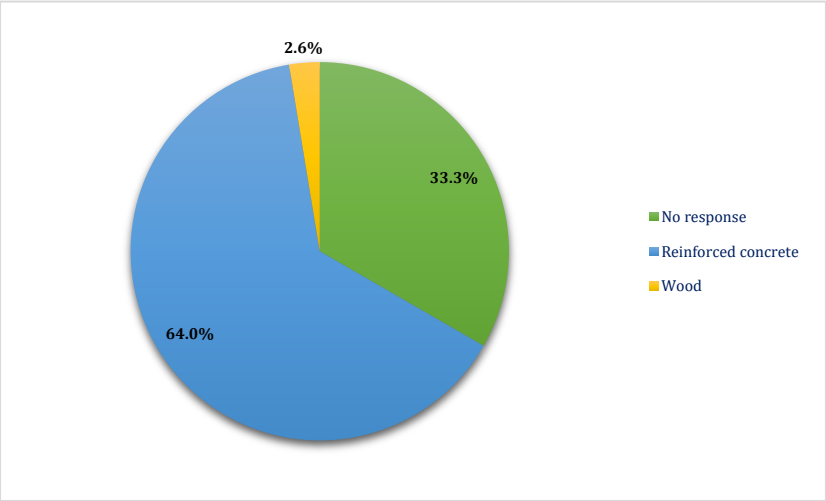

Figure 44 Construction Material of Rooms

The survey on school building rooms in the entities reveals a significant gap, with 33.3% not responding about construction materials, indicating a need for improved data collection. Among responses, 64.0% prefer reinforced concrete, reflecting a prevalent choice for durable and robust construction. The minimal use of wood (2.6%) suggests a deliberate selection, potentially for aesthetic or environmental reasons, to create a more natural and visually attractive learning environment. This information underscores the importance of comprehensive data collection for a nuanced understanding of construction practices in school buildings within the surveyed entities.

5.3.2 Repairment Needs for Disaster Preparedness Activities

5.3.2.1 School Infrastructure

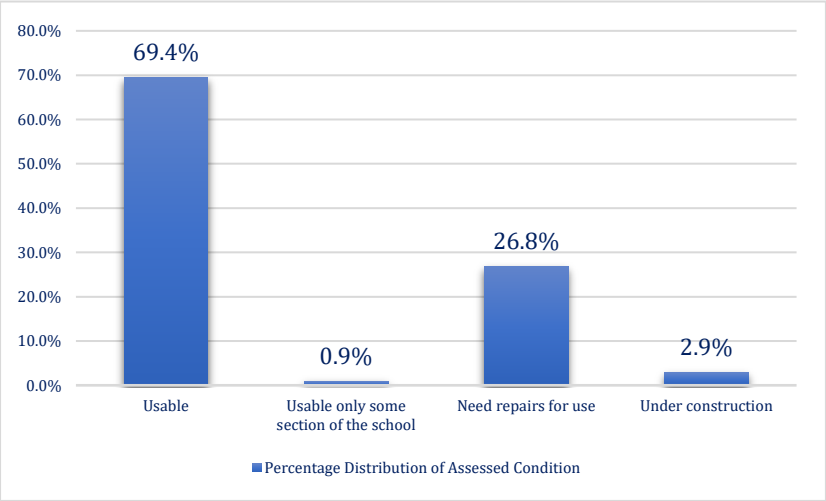

Figure 45 Repairment Needs as per Functions of the Schools

The overall analysis of schools reveals a favourable scenario, with 69.4% entirely usable, reflecting well-maintained infrastructure. A small percentage (0.9%) of schools indicate that these schools are partially usable, suggesting specific sections need attention. Notably, 26.8% of schools need repairs, emphasising the importance of maintenance for optimal functionality. Additionally, 2.9% are under construction, signalling ongoing efforts to enhance educational infrastructure. This classification provides insights into schools' diverse conditions, highlighting strengths and areas requiring attention.

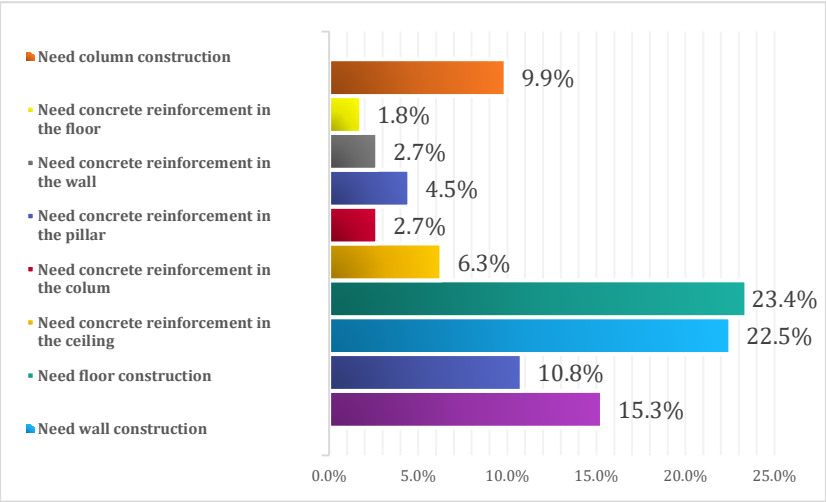

Figure 46 Repairment Needs as per Structural Element

The data highlights significant repair needs in surveyed buildings, with the highest demand in wall construction at 22.5%, emphasising issues with vertical structural elements. Floor construction follows closely at 23.4%, underscoring concerns related to foundations. Ceiling construction is a notable requirement at 15.3%, indicating overhead structure issues. The need for column and pillar construction, at 9.9% and 10.8%, suggests attention to vertical support elements. While less prevalent, open reinforcement needs exist, with the highest demand in ceilings at 6.3%. The diverse distribution underscores the importance of a targeted approach to building maintenance, emphasising a comprehensive strategy for effective structural improvement.

5.3.2.2 School Rooms

The analysis of surveyed schools shows that 75% with usable rooms indicate satisfactory learning infrastructure. However, 21% report room needing repair, emphasising a substantial requirement for maintenance to ensure a conducive environment. Additionally, 4% mention rooms under construction, reflecting ongoing efforts to enhance or expand infrastructure, showcasing a commitment to continuous development. This distribution highlights the current state of educational facilities, with a significant portion being functional, a notable need for repairs, and a proactive approach towards improvement and expansion in a smaller percentage of schools.

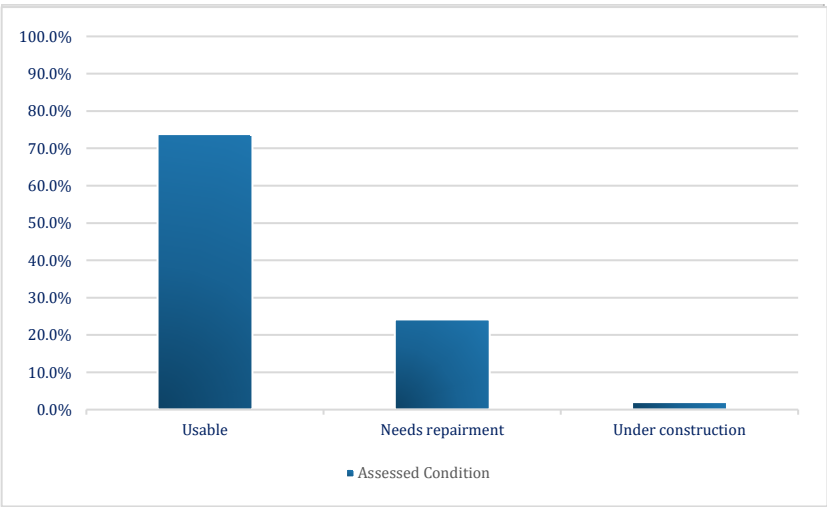

Figure 47 Status of the Windows

5.3.2.3 Toilet

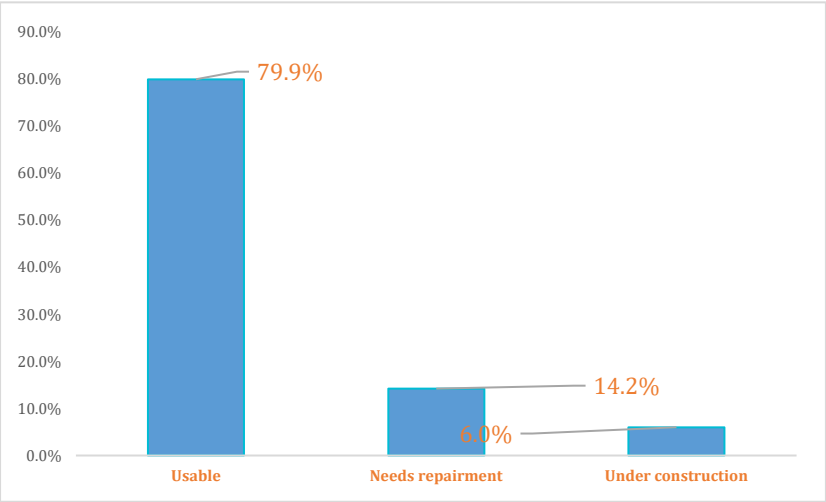

Figure 48 Toilet condition

The analysis of toilet conditions in surveyed schools indicates that 79.9% have usable facilities, showcasing a commitment to maintaining a healthy learning environment. However, 14.2% report the need for repairs, highlighting a significant portion requiring attention. The 6.0% under construction signifies proactive efforts to enhance and expand sanitary infrastructure, reflecting a commitment to ongoing development. This awareness of toilet conditions informs strategies for improvement, emphasising the importance of maintaining and upgrading facilities to ensure a conducive and hygienic environment in educational institutions.

5.3.2.4 Windows

In surveyed schools, 73.8% report usable windows, underscoring a commitment to a conducive learning environment. However, 24.2% need repair, emphasising the significant portion requiring attention for structural or aesthetic issues. Additionally, 2.0% are under construction, reflecting a proactive approach to modernising infrastructure and meeting evolving needs. This data highlights a balance between maintaining current functionality and investing in future improvements, aligning with contemporary energy efficiency and design standards.

5.3.2.5 Doors

In surveyed schools, 80.5% report usable doors, highlighting a commitment to maintaining a secure learning environment. However, 18.8% require repairs, emphasising the need for attention to door frames, locks, and wear and tear. A minimal 0.8% note doors are under construction, reflecting a forward-looking approach to meet evolving standards in security and design. This data illustrates the importance of ongoing maintenance and development in educational infrastructure to ensure functional and secure entry points for students and staff.

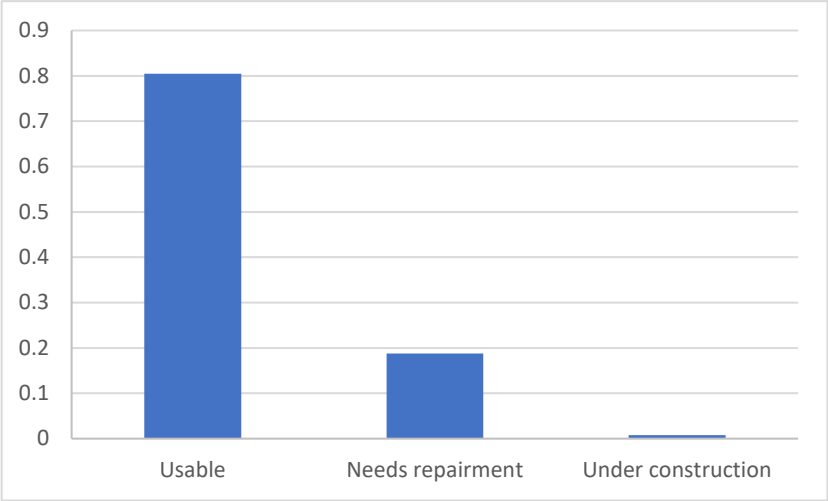

Figure 49 Status of the Doors

5.3.2.6 Roads

Analysing the condition of the roads from community to schools varied across districts. The roads from community to school of GPS and AS at Rangpur exhibits a balanced distribution, with 12.6% usable roads and 13.6% needing repair. In Gaibandha, 14.6% of roads are functional, 7.8% need repair, and 1.0% are under

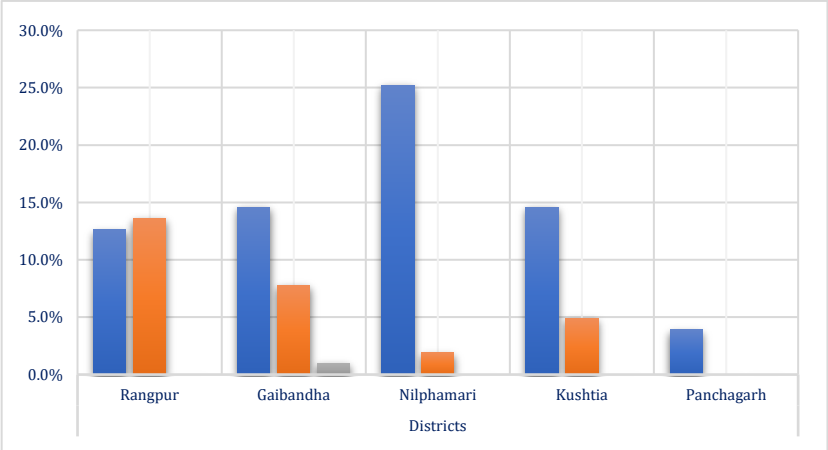

Figure 50 District Wise Road Condition from School to Community

construction. Nilphamari boasts 25.2% usable roads and minimal repair needs, with no ongoing construction. Kushtia has 14.6% usable roads and 4.9% needing repair, mirroring Rangpur's trend. Panchagarh faces challenges, with only 3.9% of roads being functional, indicating a potential need for improvement. These insights highlight disparities in road conditions connecting schools to the community, emphasising the importance of targeted infrastructure development and maintenance efforts.

6 BEST PRACTICES BY THE SCHOOL COMMUNITY ON DISASTER PREPAREDNESS AND RESPONSE PLANNING

The best practices by the school community of the government primary schools and Anandalok schools are stated in the following section.

Community Engagement and Education

The focus on community input in developing hazard calendars has been a successful strategy for the government primary schools. It has increased awareness of local disasters and has helped in tailored response planning among the students and teachers. School-based disaster preparedness and awareness programs in both government and Anandalok schools have also contributed to community resilience.

Early Warning and Communication Systems

Anandalok School committees help to spread early warnings to the families through the students and teachers. This has enhanced the community's ability to promptly prepare for and respond to disasters.

Infrastructure Analysis and Maintenance

Regular assessment of school infrastructure, including toilet facilities, water supply, and classroom conditions by Anandalok school committees, has ensured that educational institutions remain safe and functional. This has been crucial for maintaining continuous education during and after disasters.

Energy and Water Resource Management

Reliance on renewable energy sources like solar energy, and the predominant use of tube wells for water, has demonstrated successful resource management strategies in Anandalok schools.

Safety and Accessibility Features

The presence of ramps for persons with disabilities and the installation of railings in some Anandalok schools have indicated an awareness of inclusivity and safety in infrastructure planning.

Environmental Sustainability

The widespread adoption of plantation initiatives by government schools has shown a commitment to environmental sustainability, which is essential for long-term disaster resilience.

Disaster Preparedness Training and Workshops

The positive trend in implementing disaster preparedness initiatives through workshops has effectively equipped individuals with the necessary skills and knowledge.

Community-Centric Approach

The dual purpose of government schools as education centres and shelter homes in emergencies has reflected a community-centric approach, integrating educational infrastructure into broader community welfare.

Effective Waste Management

The varied approaches to waste management in Anandalok schools, like incineration and dustbins, have shown efforts to handle waste effectively, which has been crucial in maintaining a healthy environment.

7 MAJOR RECOMMENDATIONS

7.1 Policy Recommendations to Improve Disaster Preparedness in Schools

- There remains a lack of adequate bridging education with disaster management in the national policy documents regarding disaster management (i.e., Disaster Management Act, National Disaster Management Policy and National Plan for Disaster Management 2021-2025). The disaster management aspects need to be included in the curriculum, emphasising the enhancement of the resilience of school children and authorities.
- The National Education Policy need to ensure a proper guideline for the school physical infrastructure since it is the sectoral national document and it may guide the other infrastructure-related documents to enhance infrastructural sustainability during disasters. Installation of protective boundaries and gates to enhance the security of children need to be necessitated in the infrastructure guidelines.
- The Disaster Management Act need to address the school management committee's role in lessening disaster risk and instructions on using school infrastructure as shelter from the local level perspective to lessen the vulnerability of children and school authorities. The school committee's roles and responsibilities need to be detailed to ensure proper guidelines are received before a disaster.
- Every hazard needs to be prioritised in the National Disaster Management Policy and action plans need to be prepared for effective disaster risk reduction.

7.2 Recommendations for Communities and School Authorities on Disaster Preparedness

- The school management committee need to prepare teaching aid for the student of different classes to enhance their knowledge level on disaster preparedness.
- The disaster management aspects are not well documented in the curriculum. Thus, teachers should be trained to incorporate disaster related topics in the regular national curriculum of different classes.
- Regular mock drills on disaster preparedness regarding all hazards and safety need to be organised in the school compound for students and staff by the school management committee.. Evacuation rules can be set up and practiced with much emphasis in the mock drill sessions.
- There is a lack of insurance coverage to pool economic risks during the event of disasters. In this case, the school management committee can set up a central fund from the regular expenditure section, which will be used for infrastructural repair.
- Schools can take the initiative to enhance teachers' knowledge about infrastructural damages that may occur during different disasters so that they can report them immediately. A comprehensive building maintenance and improvement plan based on

varied structural issues needs to be developed for the school authorities.

- Awareness-raising programs for children and staff need to be organised by the school management committee frequently to help them stay prepared for any sudden disaster.
- The school authority needs to communicate with the local disaster management committee to acknowledge and leverage schools as community hubs, particularly in emergencies.

7.3 Recommendations to Improve Infrastructures for Assuring Disaster Preparedness

- Collaboration among LGED, GUK, Jagorani Chakra Foundation, PEDP-2, and other stakeholders need to be increased and search for external funding sources such as ADB, USAID, and MoPME to build sustainable school infrastructures.
- Resource allocation needs optimisation through proper area planning. Also, emphasise the importance of efficient land use in school construction projects.
- The usage of reinforced concrete needs to be promoted for its structural stability. Challenges of losing plaster on walls, floor cracks, and wall-related issues need to be prioritised.
- The provision of gender-specific facilities, particularly toilets and handwash facilities in the school infrastructure or compound, need to be built to provide women opportunities to access basic facilities.
- Sanitation and water supply-related issues need to be solved in the surveyed schools to ensure sanitation. The construction and maintenance of sanitary latrines with water seals for a healthy learning environment needs attention.
- Active plantation initiatives for ecological balance need to be emphasised and diversity in fruit plantation types need to be encouraged, considering economic, nutritional, and local factors.
- The construction of ramps for persons with disabilities needs more emphasis on school infrastructure. Also, be aware of installing railings in stairs for safety standards.

8 CONCLUSION

Multiple disasters in Bangladesh have resulted in significant damage to the livelihoods, education, health and social infrastructure of the population. This study evaluates infrastructure, capacity building and community mobilisation of 114 primary schools of Bangladesh along with the community surrounding them to improve the disaster preparedness of these schools. Occurrence of natural disasters such as droughts, floods, nor'westers, erratic rainfall, river erosion, and heat waves, etc. affects the livelihood, education and health of the communities. The current condition of the schools and knowledge regarding disaster preparedness were assessed to examine the need of the schools for disaster preparedness for the upcoming disasters. The infrastructural elements of the schools were assessed and prioritised to develop a technical guideline for repairing, maintenance and further improvement of the schools. Additionally, the study elaborates the status of disaster preparedness and disaster response planning of the schools and the community people where community-based, school-based and infrastructure-based disaster risk management initiatives were identified to assess the current level of disaster awareness among school communities including school children, teachers and school committees. Moreover, the best practices for disaster preparedness in school communities were recognised to offer critical insights for regions and communities facing similar challenges regarding disaster preparedness. For improving the disaster preparedness and disaster risk management initiatives in the educational institutions and the community of the disaster impacted areas, general and policy recommendation were suggested.

9 PHOTO GALLERY

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