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Assessing Community Resilience against Climatic Disasters: A Case Study on Local Adaptation Strategies in the Barguna District

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Abstract

Natural disasters driven by climate change significantly impact the socio-ecological system, particularly in vulnerable regions like the Barguna District of Bangladesh. This study uses quantitative and qualitative methods to examine community resilience and local adaptation strategies against climate-induced disasters. Data were collected from 300 households, complemented by focus group discussions and key informant interviews. Geographic vulnerabilities, insufficient disaster education, and limited stakeholder representation exacerbate the challenges that Barguna communities face. The study reveals that 52.5% of respondents hold a negative outlook on their community's future resilience to climate-induced disasters, with only 10.8% expressing a very positive perception and 4.9% being extremely optimistic about adaptation and recovery. These findings underscore critical gaps in policy implementation, resource allocation, and community engagement that hinder effective resilience-building. Analysis reveals that local coping mechanisms, while effective to some extent, require substantial enhancement to address the frequency and severity of disasters. Traditional methods such as crop diversification, soil management, and early warning systems are underutilized due to inadequate infrastructure and awareness. The study proposes an enhanced disaster management framework that integrates local knowledge with government policies, addressing the 40.67% lacking understanding of the Disaster Management Framework, the 45% advocating for community representation, and the 77% emphasizing the urgent need for targeted strategies to manage recurring cyclone threats in Barguna. This framework aims to strengthen community resilience, mitigate disaster impacts, and support sustainable development in Barguna. By bridging the gap between policy and practice, the research underscores the need for inclusive and context-specific disaster management strategies. The findings provide actionable recommendations to improve preparedness and reduce the socioeconomic and environmental repercussions of climate-induced disasters.

Keywords

Climate Vulnerable Community, Disaster Management Framework, Government Policy, Adaptation Strategy, Resilient Framework

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Introduction

The Barguna District in Bangladesh is highly vulnerable to climate-induced hazards, particularly cyclones and tidal surges (Majumder et al., 2017). Barguna City's geographical and environmental conditions are influenced by a range of causes, both local and regional. Hassan (2017) stated that urban growth has led to a reduction in arable land and vegetation cover, along with an increase in impermeable surfaces. (Jamal & Ajmal, 2020) demonstrates a substantial correlation between socioeconomic class and environmental quality in metropolitan settings. Lower socioeconomic neighborhoods often endure worse environmental conditions, rendering inhabitants more vulnerable to health problems. (Siguan, 2022) emphasizes that the city's location in a low-lying, flat terrain heightens its vulnerability to natural calamities. This area is very vulnerable to many climate-related disasters including cyclones, tidal surges, floods, saline intrusions, and droughts as documented by (Dastagir, 2015) Climate change exacerbates the spread of infectious diseases, resulting in dehydration, malnutrition, and heat-related illnesses, posing a threat to the health of coastal populations (Kabir & Khan, 2016).

The district's susceptibility to these hazards is exacerbated by issues such as insufficient comprehension, lack of adaptive technologies, and inadequate response from the local population (Majumder et al., 2017). Effective evacuation plans are essential for coastal regions susceptible to emergencies. Early warning systems, evacuation pathways, and shelters are essential components of evacuation planning (Jayasiri et al., 2020). The problems are worsened by the expected rise in temperature, changes in rainfall patterns, and the increase in sea levels, all of which would significantly impact food security, poverty reduction, and sustainable development in the area (Mojid, 2020). Community perceptions of climate-induced disasters vary based on characteristics like faith in climate change communication, geographical location, and awareness of climate change (Boon, 2016). Perceptions can influence community resilience by affecting awareness of tourism's implications in disaster-prone areas (Tsai et al., 2016). In spite of awareness and planning, the practical implementation of climate change adaptation actions continues to be a challenge (Birchall & Bonnett, 2021). In order to avert and alleviate the consequences of forthcoming natural calamities, it is imperative to carry out comprehensive investigations on this matter and thoroughly analyze their capacity to withstand and adjust to such events. Thorough research findings will inform our suggestions regarding the adaptability and resilience of communities in response to climate-induced disasters.

The study by (Majumder et al. 2017) highlights the complex relationship between risk perception and communication on climate-induced disasters in Barguna, Bangladesh. These calamities are exacerbated by extreme weather conditions, disaster-prone locations, and insufficient public services. Gaining insight into how communities perceive and react to conditions in areas prone to disasters is essential for effectively reducing disaster risks (Bali, 2022). Comprehending this subject is shaped by variables such as one's level of education, breadth of experience, and cultural perspectives (Khan et al., 2017; Seyedin et al., 2019). Furthermore, by establishing a direct correlation between personal experience and risk perception, it strengthens community resilience (Khan et al., 2017; Tsai et al., 2016). Information dissemination and communication that are efficient are crucial for assisting vulnerable groups (Khan et al., 2017).

However, it is essential to have a discussion on the region's inhabitants' flexibility and resilience. Furthermore, it is essential to engage in an in-depth examination of the significance of education in relation to disaster response, as well as establish a complete strategy and structure for effectively addressing disasters. The most effective method for implementing strategies to improve risk perception is to adopt a family-centered approach (Seyedin et al., 2019). Significant concern surrounds the correlation between climate change and the frequency of natural disasters (Hagon, 2021). Effective governance, financial and technical capacity, and institutional connections are essential for successful local disaster management and enhancing community resilience in Bangladesh. The interplay of rising sea levels and land subsidence markedly exacerbates coastal flooding caused by tropical cyclones (Wu et al., 2024). The below diagram provides a visual representation of key policies, programs, and strategies related to community resilience, disaster management frameworks, sustainable development goals, and climate change adaptation in Bangladesh.

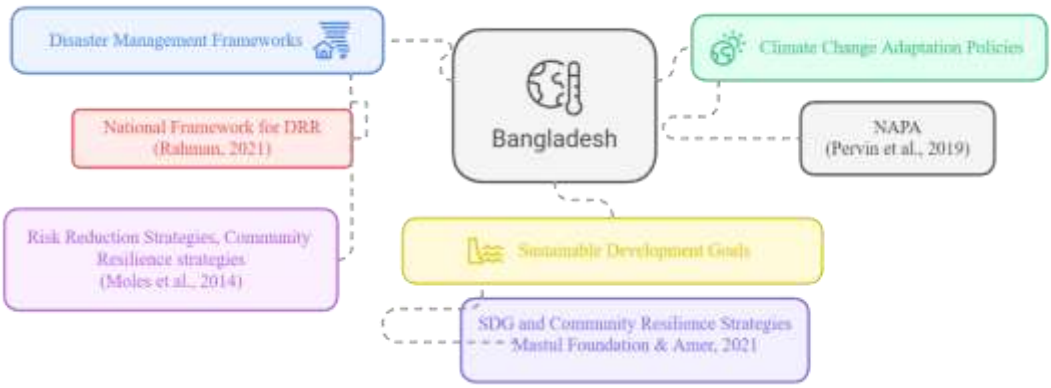

Figure 1. Visual Representation of Climate Change and Disaster Management Policies in Bangladesh

Although previous research has placed a strong emphasis on resilience to climate-induced disasters, these studies sometimes do not provide a thorough examination of local adaption tactics and how they interact with national policies. Prior research has mostly focused on disaster management frameworks from a theoretical perspective, with little actual data on the vulnerabilities, coping strategies, and views of particular communities. Furthermore, especially in high-risk locations like Barguna, research frequently overlooks the gap between the formulation of policies and their actual implementation.

The research reveals substantial knowledge gaps in disaster management and advocates for improved communication infrastructure during disasters. It proposes an enhanced disaster management framework, offering actionable recommendations to improve community resilience and ensure active participation of all local stakeholders in the Barguna District. Therefore, in brief current study aims,

i. To analyze the existing adaptation strategies in Barguna District in order to understand the present community resilience approach against climatic disasters.

ii. To evaluate and enhance the National Disaster Management Framework by identifying gaps and proposing improvements.

The study involved a questionnaire survey, a systematic literature review, KII and focus group discussions to gather data, which was then analyzed to identify key problems in the current resilience strategies, and the local adaptation strategies. Based on these findings, the study suggests an enhanced framework and provides recommendations to improve community resilience in the Barguna District.

DATA AND METHOD

Study Area: The research was conducted in Barguna District (Figure 2), a region of Bangladesh that is very susceptible to climate-related risks.

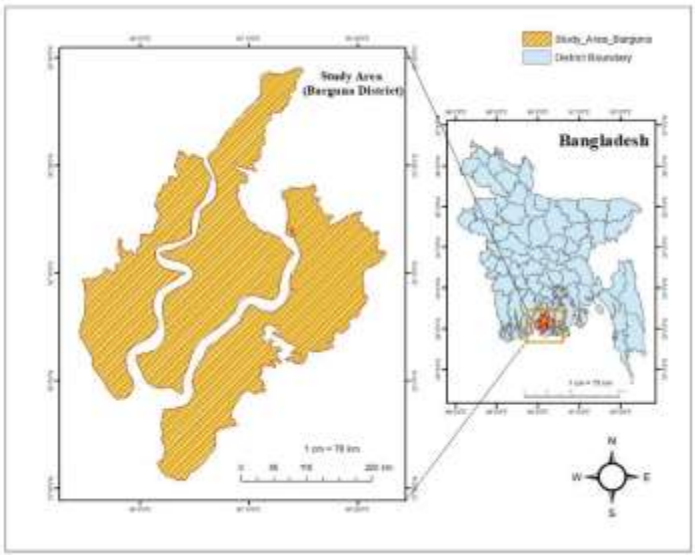

Figure 2. Study Area Map

Methodological Framework:

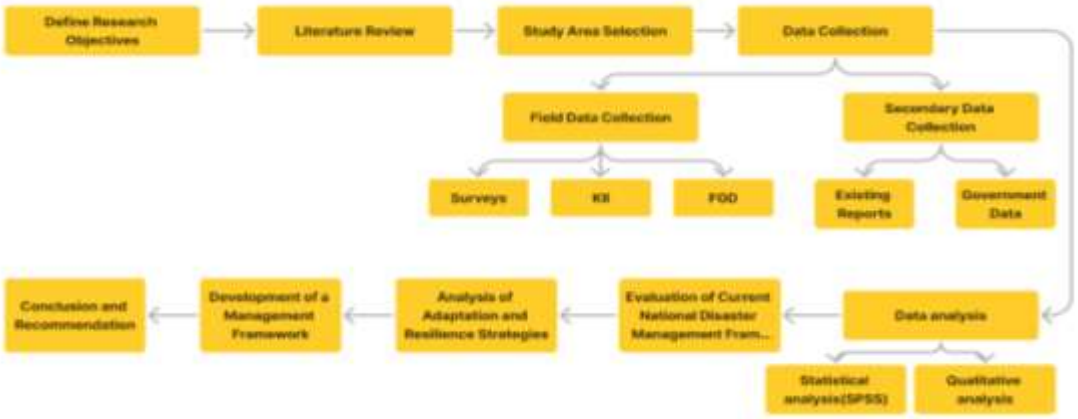

Figure 3. Methodological Framework of the study

This study performed a mixed-methods approach to assess community resilience in the Barguna District. A pre-designed questionnaire was used to conduct 300 in-depth interviews within the Barguna district, focusing on understanding community resilience, coping strategies, and disaster responses. Qualitative data were collected by purposive sampling for Key Informant Interviews (KIIs) with local officials, NGO representatives, Local Govt representatives, Religions leaders and senior community members, and Focus Group Discussions (FGDs) with two groups of 10 and 12 participants, respectively. Secondary data from government reports and media enrich primary data.

Quantitative analysis was conducted using SPSS, including descriptive statistics, correlation analysis, and multiple regression to identify key predictors of disaster preparedness. Qualitative data were thematically analyzed, highlighting policy gaps, resource allocation issues, and coping strategies. Triangulation of data sources ensured validity, leading to actionable recommendations for a resilient disaster management framework.

Sample and Data

Data has been gathered from different sources throughout the area to get comprehensive information on Barguna. Two case studies are undertaken to get insight into the present circumstances, individuals' methods of dealing with challenges, and their ability to adjust. Additionally, focus group discussions and Key Informant Interviews (KII) were initiated to get comprehensive data and ensure data consistency. 300 data was collected to complete the study

Enhanced Disaster Management Framework

1. Knowledge gap regarding Disaster Management Framework
    - Number of people: 122 - Percentage: $\frac{122}{300} * 100 \approx 40.67\%$
2. Need of adding community representatives to local disaster management committee
    - Number of people: 135 - Percentage: $\frac{135}{300} \; x \; 100 \approx 45\%$
3. Not interested in providing feedback
    - Number of people: 300 – (122+135) = 43 - Percentage: $\frac{43}{300} \; x \; 100 \approx 14.33\%$
4. Need of special attention regarding climate-induced disasters
    - Number of people: 231 - Percentage: $\frac{231}{300} \; x \; 100 \approx 77\%$
    - Less number of people 69 means 33% have not any idea regarding this.

Of these, 40.67% of the respondents lack understanding of a disaster management system. 45% of respondents feel that local disaster management committees need to include community representation. That indicates more general community involvement in disaster preparation and management is necessary. 14.33% of respondents answered nothing on this matter. However, a good percentage, 77% think that climate-induced disasters need particular management because the yearly cyclone danger of Barguna emphasizes the urgent issues.

Results and Discussion

Case studies

A case study has been conducted to find how participants thoughts about the future resilience of their communities in the face of climate-induced disasters. The following table is formed by study data collected from the local population.

Table 1. Community perception of future resilience in the term of climate-induced disasters.

		Frequency	Percent	Valid %	Cumulative %
Valid	Negative	107	52.5	54.6	54.6
	Little Positive	37	18.1	18.9	73.5
	Moderately Positive	20	9.8	10.2	83.7
	Very Positive	22	10.8	11.2	94.9
	Extremely Positive	10	4.9	5.1	100.0
	Total	196	96.1	100.0	
Missing	In System	8	3.9		
Total		204	100.0		

Table 1 clearly demonstrates the extent of confidence among Barguna inhabitants about their future ability to recover and adapt. According on the facts, it can be inferred that they mostly have a pessimistic outlook. We used focus group discussions and Key Informant Interviews (KII) to comprehensively analyse data pertaining to this issue. After analyzing comprehensive data, we firmly believe that there is a deficiency in infrastructure, resources, and other types of assistance along with there is a huge between the people and the govt.

The area facing an inadequate level of environmental education, evidenced by ground information. It is urgent to notice the environmental education in order to improve catastrophe preparation. The environmental degradation is a consequence of people's lack of knowledge. Based on the study, it is imperative to enhance awareness, develop infrastructure, and boost the environmental education in order to effectively address the situation. Second case study has been used to analyze the coping mechanisms and adaptability of individuals.

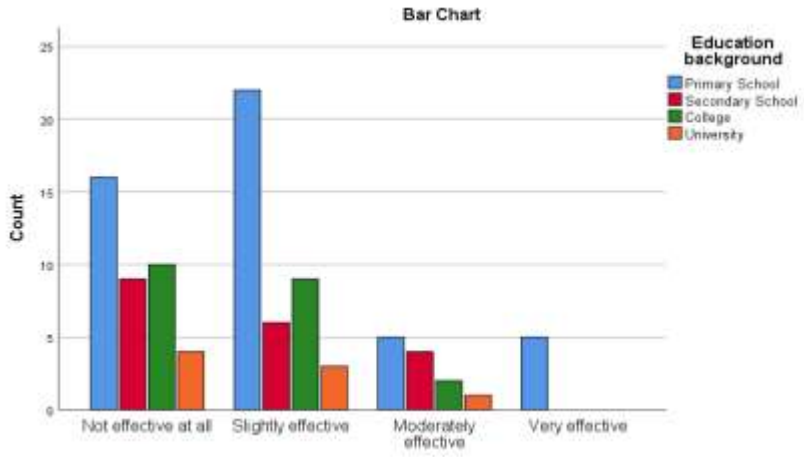

Figure 4. Local Perception about the effectiveness of traditional coping strategies

Figure 4 visually illustrates their approach to traditional techniques of managing natural disasters. Upon analyzing the acquired data and deriving conclusions from the focus group conversations, it is evident that the participants possess a deficiency in comprehending how to successfully handle calamities. If folks are provided with good advice and information about the climate and ecology of the region, the extent of this loss will be greatly reduced.

Findings from Focus Group Discussions and Key Informant Interviews in Barguna District

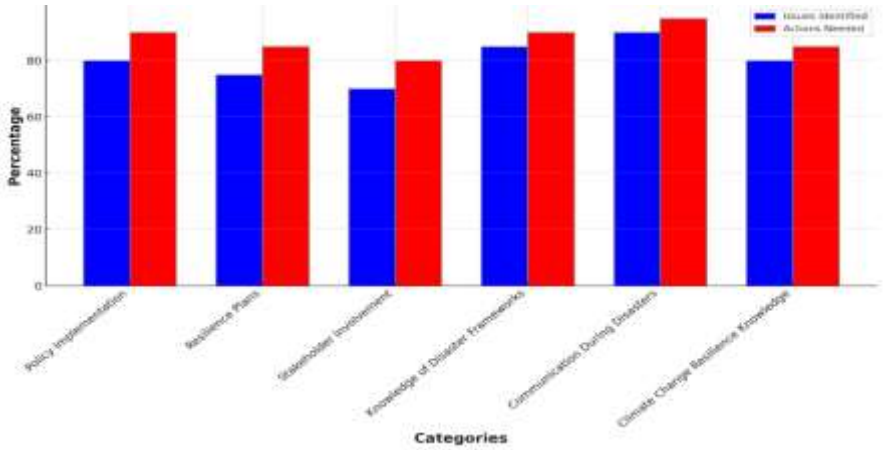

Figure 5. Identified Issues and Actions Needed in Climate Resilience

The focus group discussions and Key Informant Interviews (KII) (Figure 5) conducted with local stakeholders, including representatives from local government, youth, and administration, provided valuable insights into the adaptation and mitigation strategies for climate resilience in the Barguna District. These discussions revealed several critical gaps and challenges that need to be addressed to enhance the region's resilience to climate-related disasters.

Policy Implementation: Near 80% gap identified and 90% of actions needed, significant gap between policy formulation and implementation, that ask urgent corrective measures.
Resilience Plans: The lack of comprehensive resilience plans, with 75% of issues identified and 85% of actions needed, highlights the necessity for strategies.
Stakeholder Involvement: Insufficient involvement of local stakeholders, identified gap 70% and needing near 80% of actions, requires immediate attention.

Climate Change Resilience Knowledge: Lack of knowledge, identified by 80% and needing 85% of actions, calls for comprehensive education and training programs.

The discussion shows a big gap between policymaking and execution. Despite policies, field execution is poor along with comprehensive resilience planning for Barguna district is lacking. This lack of preparedness impacts on climate catastrophe response and recovery. Local fishermen, farmers, laborers, and dried fish processors are under-represented in planning and decision-making. Locals know nothing about disaster management frameworks. Climate change

resilience methods are poorly understood by communities. Their adaptation efforts and community resilience are disbalanced by wrong policies.

Adaptation and Mitigation strategies

Through extensive investigation, we have been find many options for adaptability. One initiative is to enhance the crop variety and rotation in the area. That enhance the soil quality and boosts crop production by reducing insect infestation. Local farmers also have the advantage ideas for cultivating new crops that are well-suited to their specific region. Initiative on this sector will have positive impact on the region's economy.

Changing agriculture planting and harvesting times may also be impacted. Water conservation and soil management may help adapt this region. River erosion may be reduced by restoring dams, planting trees, and building an appropriate infrastructure. This region My have more career possibilities to aid adaption. Resources are available, but poor planning prevents their use. Improving relevant education quality and quantity is also vital.

Mitigation strategies require that environmental and disaster education in the region be improved in quality and made accessible to all levels of society. The implementation of ubiquitous environmental and disaster education in the region is an absolute necessity.

Policy and governance

The upgraded disaster management system adapts to climate change to build community resilience. The framework addresses key results such improving disaster management, use early warning systems, engage stakeholders, and promoting resilience. Effective disaster management requires coordination from national to community levels.

Proposed Enhanced Disaster Management Framework

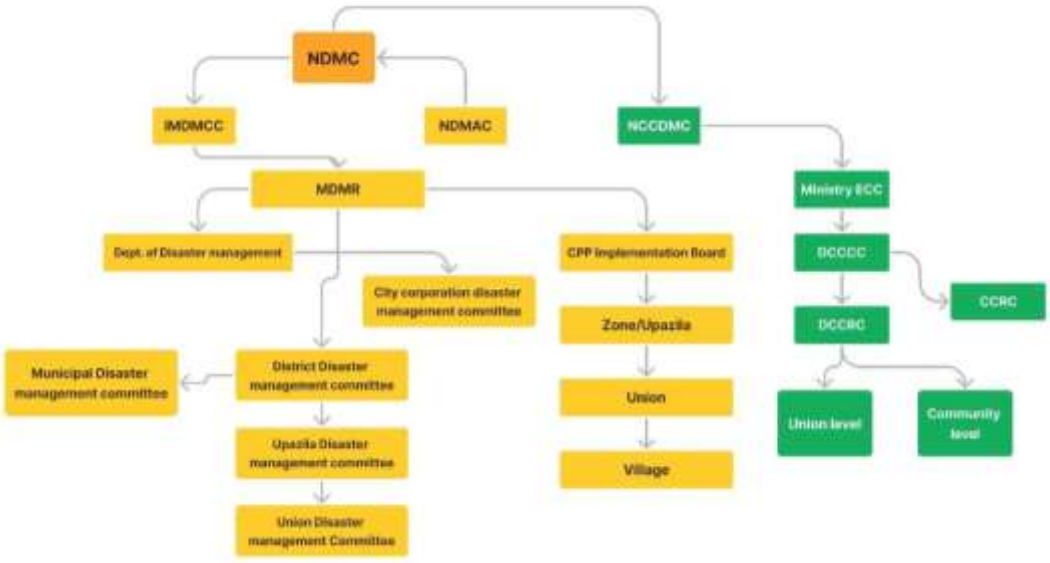

Figure 6. Enhanced Disaster Management Framework

The expanded disaster management framework (Figure 6) for Coastal Districts like Barguna addresses climate-induced disaster with a holistic approach. The NCCDMC will manage national climate change policies and plans. They will assist the NDMC in climate change disaster management. The NCCDMC promotes national-local disaster management coordination. The Ministry of Environment and Climate Change and the Ministry of Food and Disaster Management will work together regarding climate change mitigation and adaptation into disaster management programs. This will simplify policy frameworks and improve climate-related resource allocation and coordination among government ministries.

The Divisional Climate Change Coordination Committee (DCCCC) will oversee the allocation of resources and develop strategic plans for the long-term. The DCCCC will oversee and organise efforts related to climate change adaptation and resilience. The District Climate Change and Resilience Committee (DCCRC) will enhance the District Disaster Management Committee (DDMC) by including additional tasks related to climate change. The DCCRC provides assistance to initiatives focused on building resilience to climate change at the district level. The primary objectives are to conduct climate risk assessments and include local stakeholders, such as fishermen and farmers, in the decision-making process.

The Upazila Climate Action and Response Team (UCART) will work at the Upazila level to improve the UDMC. Localized climate change monitoring and early action systems will increase readiness and reaction, according to the UCART. The team will engage local stakeholders to improve disaster management coordination.

The City Climate Resilience Council (CCRC) and City Corporation Disaster Management Committee (CCDMC) will prioritize urban climate change adaptation and mitigation methods. Improve urban planning and infrastructure resiliency. The council is devoted to early warning systems and catastrophe preparedness in urban areas.
The Union prioritizes grassroots climate change education, agriculture, and livelihood diversification. Local conservation and resilience-building are implemented by the Union Climate Resilience Committee (UCRC) and Union Disaster Management Committee (UDMC). UCRC educational activities will raise community knowledge and preparation for climate-related calamities.

Community members and volunteers will work together in crisis management via Local Climate Resilience Groups (LCRGs). To ensure successful response and recovery, the LCRGs will lead climate change adaptation, emergency response planning, and environmental stewardship with other disaster management levels. An organized and comprehensive catastrophe management will result from this governance system. It prioritizes local stakeholders and community leadership in climate-induced crises. The framework emphasizes resilience, readiness, and sustainable development to address these issues.

Public Perception Regarding Proposed Enhanced Disaster Management Framework

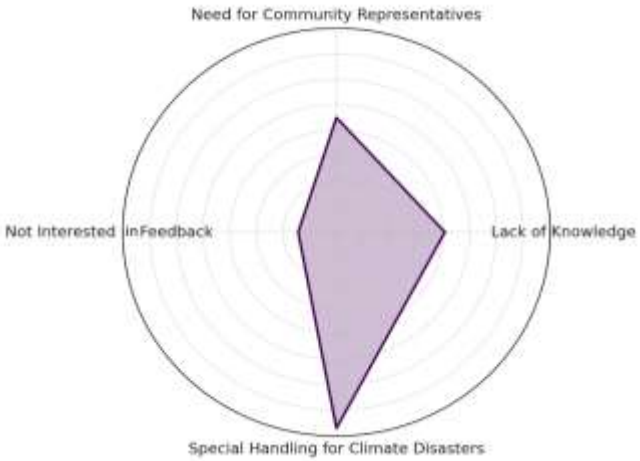

Figure 7. Public Opinion regarding proposed enhanced disaster management Framework

The radar map, shown in Figure 7, displays the survey findings about the enhanced disaster management framework. The study finds four primary areas of concern: insufficient on understanding, community representation, disinterest in receiving input, and the urgent call of climate emergency. The chart's axes show distinct groups, with the length of each category indicating the proportion of responses. According to the statistics, 40.67% of individuals have lack of understanding, while 45% of participants express the belief in the significance of having community representatives. Based on the study, an overwhelming majority of 77% of individuals believe that climate-related disaster should be managed seriously. Moreover, a only 14.33% of individuals are not interested in providing comments (Figure 7).

Conclusion

The study highlights gaps in policy implementation, resource allocation, and stakeholder involvement, exposing serious obstacles to enhancing community resilience against climate-induced catastrophes in the Barguna District. Disaster preparedness and response operations are hampered by low community involvement and a lack of public knowledge. The majority of respondents are doubtful of the government's commitment to tackling these problems, and only 25.5% think their neighborhood is resilient. In order to tackle these problems, the study suggests that community representatives be included in disaster management committees, that disaster education programs be improved, that resources be strategically allocated to support livelihood diversification programs, early warning systems, and infrastructure, and that inclusive governance be encouraged. Policymakers and local governments can promote a more sustainable, inclusive, and responsive approach to disaster management by using these tactics, which will increase community resilience and lessen the socioeconomic and environmental effects of disasters.

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References

Bali, R. (2022). Importance of Community Awareness and Preparedness in Disaster Risk Reduction. Research Review International Journal of Multidisciplinary, 7(10), 40–57. https://doi.org/10.31305/rrijm.2022.v07.i10.005

Birchall, S. J., & Bonnett, N. (2021). Climate change adaptation policy and practice: The role of agents, institutions and systems. Cities, 108, 103001. https://doi.org/10.1016/j.cities.2020.103001

Boon, H. J. (2016). Perceptions of climate change risk in four disaster-impacted rural Australian towns. Regional Environmental Change, 16(1), 137–149. https://doi.org/10.1007/s10113-014-0744-3

Dastagir, M. R. (2015). Modeling recent climate change induced extreme events in Bangladesh: A review. Weather and Climate Extremes, 7, 49–60. https://doi.org/10.1016/j.wace.2014.10.003

Hagon, K. (2021). Protecting People in the Context of Climate Change and Disasters: Setting the Scene. Proceedings of the ASIL Annual Meeting, 115, 156–158. https://doi.org/10.1017/amp.2021.146

Hassan, M. M. (2017). Monitoring land use/land cover change, urban growth dynamics and landscape pattern analysis in five fastest urbanized cities in Bangladesh. Remote Sensing Applications: Society and Environment, 7, 69–83. https://doi.org/10.1016/j.rsase.2017.07.001

Jamal, S., & Ajmal, U. (2020). Assessing the Relationship Between Neighbourhood Socio-economic Status and Environmental Quality. In R. B. Singh, B. Srinagesh, & S. Anand (Eds.), *Urban Health Risk and Resilience in Asian Cities* (pp. 445–459). Springer Singapore. https://doi.org/10.1007/978-981-15-1205-6_25

Jayasiri, G. P., Randil, O. P. C., Perera, G. M. C. A., Siriwardana, C. S. A., Dissanayake, P. B. R., & Bandara, C. S. (2020). Important Aspects of Evacuation Planning for the Coastal Communities in Sri Lanka. In R. Dissanayake & P. Mendis (Eds.), *ICSBE 2018* (Vol. 44, pp. 3–10). Springer Singapore. https://doi.org/10.1007/978-981-13-9749-3_1

Kabir, R., & Khan, H. (2016, November 19). *Climate change induced natural disasters impact on the health of the coastal people in Bangladesh*. https://www.semanticscholar.org/paper/Climate-change-induced-natural-disasters-impact-on-Kabir-Khan/739f1beaefa699b56a6a44707785d8bb2a92a2cc

Khan, M. G., Johar, F., & Baba, A. (2017, April 6). *Disaster management risk perception of local communities*. https://www.semanticscholar.org/paper/DISASTER-MANAGEMENT-RISK-PERCEPTION-OF-LOCAL-Khan-Johar/2714dd2b502da984196f7294c6573b1c698ace2b

Majumder, M. S. I., Hasan, I., Mandal, S., Islam, M., Rahman, M., Hawlader, N., & Sultana, I. (2017). *Climate Change Induced Multi Hazards Disaster Risk Assessment in Southern Coastal Belt of Bangladesh*. https://www.semanticscholar.org/paper/Climate-Change-Induced-Multi-Hazards-Disaster-Risk-Majumder-Hasan/c5f7cc743d23dbfcc9126853e8d9b59b9b9e6b38

Mojid, M. A. (2020). Climate change-induced challenges to sustainable development in Bangladesh. IOP Conference Series: Earth and Environmental Science, 423(1), 012001. https://doi.org/10.1088/1755-1315/423/1/012001

Seyedin, H., Samadipour, E., & Salmani, I. (2019). Intervention strategies for improvement of disasters risk perception: Family-centered approach. Journal of Education and Health Promotion, 8, 63. https://www.semanticscholar.org/paper/Intervention-strategies-for-improvement-of-risk-Seyedin-Samadipour/5b849bffc06dc9618c98a5debbbe63463c2802ea

Siguan, A. A. (2022). Exploring Typhoon Yolanda (Haiyan) victims' narratives in the pandemic. Journal of Public Health, 44(3), e457–e458. https://doi.org/10.1093/pubmed/fdab291

Tsai, C. H., Wu, T. (Emily), Wall, G., & Linliu, S.C. (2016). Perceptions of tourism impacts and community resilience to natural disasters. Tourism Geographies, 18(2), 152–173. https://doi.org/10.1080/14616688.2016.1149875

Wu, G., Liu, Q., Xu, H., & Wang, J. (2024). Modelling the combined impact of sea level rise, land subsidence, and tropical cyclones in compound flooding of coastal cities. Ocean & Coastal Management, 252, 107107. https://doi.org/10.1016/j.ocecoaman.2024