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ORIGINAL PAPER

Institutional dynamics and climate adaptation: unveiling the challenges and opportunities in coastal Bangladesh

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Abstract

This study explores the institutional dynamics and adaptive capacity of coastal communities in Bangladesh in the face of climate change, focusing on Shyamnagar Upazila and Kalapara Upazila. Utilizing the Institutional Analysis and Development (IAD) Framework, we examine the interplay between exogenous factors (e.g., geography, climate-related hazards) and endogenous variables (e.g., informal rules, decision-making structures) that shape local governance and adaptive responses. The research employs a constructivist grounded theory approach to provide in-depth, context-specific insights from community members, local government officials, and civil society organizations. Our findings reveal significant challenges, including the lack of institutional capacity, non-participatory decision-making processes, political bias, and unsustainable adaptation projects. NGOs and CSOs play a crucial yet limited role in resilience building due to their dependency on short-term donor funding. We propose a grounded theory emphasizing the need for robust institutional networks, inclusive governance, long-term planning, and enhanced coordination among stakeholders to improve the adaptive capacity of vulnerable communities. This study contributes to the broader discourse on sustainable and inclusive climate governance by highlighting critical areas for strengthening local institutional capacity in climate change adaptation.

Keywords Climate change adaptation · Coastal area · Vulnerable community · Adaptive capacity · Participatory decision-making

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Introduction

Climate change adaptation at the local level has garnered significant scholarly attention, particularly regarding institutional networks, partnerships, and collaboration. Scholars argue that a robust local governance network is essential for successful community adaptation to the impacts of climate change (Fünfgeld 2015). Collaborations between local authorities and non-state actors, such as NGOs and private businesses, are effective in fostering climate change resilience (Loechel et al. 2013). In a developing country like Bangladesh, institutional capacity is necessary for establishing and deploying effective networks and partnerships (Dany et al. 2015), ultimately enhancing community resilience against the adverse effects of climate change.

As climate change continues to manifest in increasingly severe and unpredictable ways, understanding and strengthening local institutions, especially the elected local government bodies, becomes crucial. These bodies play a pivotal role in shaping adaptive responses and influencing resilience at the grassroots level (Islam et al. 2017). However, amid the urgency of adapting to a changing climate, understanding the local-level institutional dynamics from the perspectives of those most affected often remains unexplored, as the present literature provides numerous broader narratives (Coirolo and Rahman 2014; Rahman 2023).

Recent studies have emphasized the importance of local governance, including multiple institutions involved in climate adaptation. For instance, Shi et al. (2020) highlight the role of local governments in implementing adaptation measures through participatory and multi-actor approaches (e.g., government, non-government, and community organizations). Nalau et al. (2021) discuss the challenges and opportunities for enhancing institutional capacities in developing countries. Chu et al. (2019) argue that local institutions must be flexible and adaptive to respond effectively to the dynamic nature of climate change impacts. Additionally, Ford et al. (2020) examine the effectiveness of local adaptation plans and stress the need for continuous evaluation and adaptation.

While numerous studies (Banks et al. 2011; Shahid et al. 2016; Araos et al. 2017; Fatemi et al. 2020) on climate change in Bangladesh have focused on urban governance of adaptation, there is a need to explore the contribution of rural local institutional dynamics to the governance of climate change adaptation. Rahman (2018) underscores the necessity of analyzing climate change adaptation from a governance-focused perspective (i.e., institutional dynamics), particularly in rural areas where citizens often lose control over their livelihoods due to climate-related disasters and corrupt management of environmental shocks.

In this study, we focus on exploring local government institutions' capacity as the local-level institutional dynamics in Bangladesh often find their roots in these institutions' efforts (Rahman 2018). Our exploration focuses on the capacity of local government to adapt to climate change in the coastal areas of Bangladesh for two key reasons. Firstly, the Government of Bangladesh has implemented numerous projects through local institutions led by the local governments to improve climate change adaptations. Secondly, coastal areas are highly vulnerable to climate change-related disasters, experiencing various challenges, including flooding, rising sea levels, cyclones, hurricanes, and land erosion (Baills et al. 2020). Investigating local

institutional capacity for climate change adaptation will enrich our understanding of how citizens in the most vulnerable areas perceive and experience local governance actors' efforts to build adaptive capabilities and climate resilience. Here, institutional capacity in the context of climate change adaptation governance mechanisms refers to the ability of institutions to effectively design, implement, and sustain policies and strategies that address the impacts of climate change. This encompasses the human, technical, financial, and organizational resources that institutions can mobilize to respond to climate challenges. Institutional capacity is crucial for ensuring that governance mechanisms are robust, adaptive, and capable of addressing both current and future climate risks (Gupta et al. 2010; Pahl-Wostl 2019).

This study adopts a constructivist grounded theory approach to explore the local-level dynamics of institutional capacity, examining its role in enabling communities to address the adverse impacts of climate change. The constructivist grounded theory approach is vital for this study as it allows for an in-depth exploration of local-level governance and institutional dynamics within the context of climate change adaptation. This methodology facilitates the development of rich, context-specific insights by focusing on the lived experiences and narratives of community members, local government officials, and civil society organizations involved in climate adaptation efforts. It is particularly suited for uncovering the complex, nuanced interactions that shape institutional capacity and adaptive responses, which is essential for understanding how local governance structures can effectively address climate resilience challenges (Charmaz 2006; Corbin and Strauss 2014). This approach aligns with recent studies that emphasize the need for comprehensive, qualitative methods to capture the multifaceted nature of governance and institutional responses to climate change at the local level (Chu et al. 2019; Shi et al. 2020).

Constructivist grounded theory (CGT) still utilizes a framework to facilitate inductive theory building by providing a structured yet flexible methodology that guides the collection and analysis of qualitative data (Charmaz 2006). While grounded theory is inherently inductive, the use of a theoretical framework helps researchers systematically gather and interpret data through iterative cycles of coding, memo-writing, and constant comparison. This process allows for the emergence of categories and themes grounded in the participants' experiences, which are then integrated into a coherent theoretical model. This study aims to investigate the capacity of local government institutions to adapt to climate change in the coastal areas of Bangladesh, specifically exploring current governance structures, identifying challenges, and providing policy recommendations to strengthen institutional capacity and enhance community resilience.

Theoretical framework for a constructivist grounded theory

Climate change adaptation, defined as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities" (Pachauri and Reisinger 2007), presents a unique challenge for countries around the world. Despite minimal contributions to climate change, developing countries like Bangladesh suffer disproportionately from its

impacts, facing increased vulnerability to natural disasters linked to climate change. This underscores the urgency for global efforts in climate adaptation to address the disproportionate burden on these nations (Bhuiyan 2015; Tashmin et al. 2018). The coastal areas in Bangladesh are highly vulnerable to many natural disasters and their long-term environmental, agricultural, social, economic, and livelihood impacts (Tashmin et al. 2018; Uddin et al. 2019).

Flooding, storms, desertification, and drought are natural disasters that often result from climate change. Adaptation actions relocate human and material capital from areas at risk of natural disasters caused by changing climate patterns (Hallegatte et al. 2011). Uddin et al. (2019) highlighted biophysical and socio-economic drivers that build the resilience capacity of coastal communities in Bangladesh. The active role of local-level politics and governance mechanisms is pivotal in dictating many drivers of socio-economic activities in these communities (Rahman 2018). Hence, we acknowledge the role of local government, both from locally elected institutions and from the central government, in governing climate change adaptation to build community resilience. Climate adaptation governance provides a structure for how climate change will be addressed at national and local levels, involving various stakeholders, including government, NGOs, the private sector, and affected citizens (Jagers and Stripple 2003; Makombe 2013). The Bangladesh Delta Plan also emphasizes institutional capacity building and engaging diverse stakeholders, including government agencies, environmental organizations, and local communities (de Heer et al. 2012).

Effective adaptation actions by governments and NGOs significantly increase adaptive capacity, a major prerequisite for community resilience to climate change (Baxter 2019). Adaptive capacity is the ability of individuals, households, and communities to adjust, modify, or change their features and actions to respond to existing and anticipated future climatic shocks and stresses, and to take advantage of opportunities (Welle et al. 2014; Béné et al. 2016). Williams et al. (2019) claimed that adopting effective adaptation practices in the agriculture sector reduces vulnerability and improves the resilience of households to the adverse effects of climate change. Previous studies (Nguyen and James 2013; Welle et al. 2014; Jeans et al. 2017; Williams et al. 2019) identified factors such as safe housing, financial solvency, food security during disasters, managing children and older people, health issues during and after disasters, and the adoption of technology and social innovation as crucial for adaptive capacity. A safe and resistant house is vital for poor and vulnerable families, offering an effective means of managing climate-related risks and improving their adaptive capacity to respond to climate change (Lee and Lee 2017).

Similarly, food security builds adaptive capacity in the face of climate change (Cramer et al. 2016). We use the theory of adaptive capacity to understand resilience based on institutional effectiveness and capacity. Our framework is designed to explore the capacity of local government to provide climate-resilient housing, agricultural systems, livelihood means, socio-cultural developments, and labor force utilization. This study explores how these interconnections are observed in Bangladesh's coastal areas within the adaptive capacity framework.

Practically, the government cannot protect each person from the effects of climate change. This raises the question: what is the role of government at the local level in

this regard? The recent trend is making the government less hierarchical across different layers (Kettl 2002; Salamon and Elliott 2002; Frederickson and Smith 2003; Hill and Lynn 2015). Collaborative management and network governance theory indicate that complex issues like climate change adaptation require robust mechanisms to establish collaboration between government and NGOs (Pahl-Wostl 2019). In recent years, NGOs' involvement in policy advocacy and disaster response activities has significantly reduced climate vulnerability (Lopa and Ahmad 2016).

Despite progress, local governments in Bangladesh still fall short in ensuring access and participation of the poor in decision-making processes and delivering proper services. NGOs, with support from International Development Agencies (IDAs), work to build the capacity of local government institutions and raise awareness among citizens to ensure they know and understand their rights and duties (Baroi and Panday 2015). Local government institutions are important because they are closer to people and can understand their needs and aspirations. Concurrently, Civil Society Organizations (CSOs), including NGO-created Community-Based Organizations (CBOs), are aware of community needs. Thus, a partnership between local governments and non-state actors, such as aid agencies, NGOs, CSOs, CBOs, and private entities, is imperative. Most adaptation strategies are local, making local agencies, such as local government and CSOs, best suited to creating adaptive capacities (Lobo 2013). This partnership allows for a better understanding of local community needs and the ability to prioritize and implement appropriate and effective adaptation measures. It also acts as an intermediary between national-level policymakers and local elected representatives and their constituencies.

In Bangladesh, the Local Government Division under the Ministry of Local Government, Rural Development and Co-operatives leads the implementation of the 'Local Government Initiative on Climate Change (LoGIC)' project in partnership with UNDP and UNCDF. The LoGIC project has helped local governments better understand the impacts of climate change on local communities. This has enabled them to assess risks and vulnerabilities and develop adaptation plans. The project has also supported strengthening climate-resilient infrastructure. However, more sustained efforts are needed for elected representatives to own and implement adaptive climate practices (Slater 2021).

There is a strong need for community engagement to build effective networks and partnerships at the institutional level to raise resilience capacity in disaster-prone areas of Bangladesh (Paul and Hossain 2013). Studies focusing on African cities with climate vulnerabilities and Mauritius' local government capacity for climate change adaptation identified the need for a triangle between government, NGO, and community for effective local-level resilience capacity (Williams et al. 2020; Pasquini 2020). This triad provides a necessary framework for understanding how local government can build and sustain its capacity to establish an adaptive culture in the coastal areas of Bangladesh.

Previous research highlighted how local government initiated many partnerships with NGOs and the community in Bangladesh, several African countries, Mauritius, and Nepal (Jones and Boyd 2011; Rahman 2018; Pasquini 2020; Williams et al. 2020). Hence, local government capacity is crucial for the effective triad of local-

level climate resilience capacity that measures how the community can adapt to the impacts of climate change regarding livelihood and social and economic growth.

Analytical framework

This study employs the Institutional Analysis and Development (IAD) Framework, a theoretical lens crafted by Ostrom (2005, 2011), to understand the dynamics of climate change adaptation within a vulnerable community. The IAD Framework is an invaluable tool for dissecting the complex interactions among institutions, decision-making processes, and resource management, providing a structured approach to unraveling the challenges unearthed in the findings of the study.

The IAD Framework categorizes situations into action arenas, encompassing participants and action situations. Guided by exogenous variables, participants make choices within established rules and interact. The outcomes of these interactions, combined with the influence of exogenous variables, prompt participant evaluations, subsequently exerting influence on other elements within the framework (Ostrom et al. 1994).

In this context, the action arena is the coastal areas of Bangladesh, which are at the forefront of adaptation efforts. This community is influenced by a myriad of formal and informal institutions, shaping the rules and dynamics of their adaptive actions. The "rules-in-use" encapsulates the formal and informal regulations governing the community's response to climate change. Examining existing policies, cultural norms, and community practices illuminates the constraints and opportunities influencing the adaptive capacity of the community.

Analyzing decision-making structures involves scrutinizing the mechanisms through which decisions related to climate change adaptation are made, revealing the inclusivity or exclusivity of various stakeholders in the decision-making process. At the operational level, the study delves into the day-to-day activities and interactions that define the implementation of adaptation projects. The IAD Framework facilitates an exploration of the factors contributing to delays, inefficiencies, and, importantly, the impact of these operational aspects on building or impeding adaptive capacity (Whaley and Weatherhead 2015) (Fig. 1).

Assessing the outcomes of climate change adaptation projects at the local level through the lens of the IAD Framework sheds light on the effectiveness and sustainability of those initiatives. By evaluating whether these outcomes align with the needs and capacities of the community, the framework enables a nuanced understanding of the success or shortcomings of adaptive actions taken and managed by multiple institutional actors.

Methodology

This study adopts an exploratory approach, employing a constructivist grounded theory methodology within the qualitative method to gather and analyze data, formulating final inferences (Charmaz 2006). The research was conducted in the coastal

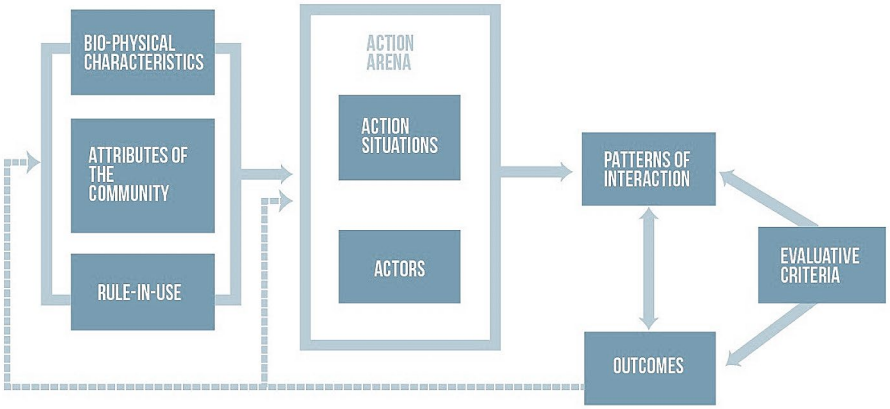

Fig. 1 Institutional analysis and development (IAD) framework (Ostrom 2005)

regions of Bangladesh. Among the nineteen coastal districts, Satkhira and Patuakhali were identified as the most severely affected areas (Roy et al. 2009). Specifically, Shyamnagar Upazila in Satkhira District, which experienced severe impacts from Cyclone Aila, and Kalapara Upazila in Patuakhali District, affected by Cyclone Sidr, were chosen as the primary study locations.

Bangladesh's administrative structure is organized into hierarchical units: Division, District, Upazila, and Union. Satkhira District bore the brunt of Cyclone Aila in 2009, with Shyamnagar Upazila being the most extensively damaged. For data collection, Burigoaliny Union and Atulia Union were selected under Shyamnagar Upazila. Similarly, Patuakhali District was severely impacted by Cyclone Sidr in 2007, leading to the loss of flood ridges and daily challenges with tidal seawater inundation. Under Kalapara Upazila, Lalua Union and Dhulasar Union were chosen for data collection.

This study explored the perceptions of the coastal community, local government officials, and civil society organizations regarding the local government's capacity to build climate resilience. Participants were selected through purposive stratified sampling based on three criteria: local citizens, local government officials, and civil society-NGO members. Local citizens were invited to participate in Focus Group Discussions (FGDs) through random invitations given to vendors and customers in the largest weekly public market. To ensure gender balance, an equal number of males and females were invited. Of the 37 people who showed interest, 30 individuals (15 males and 15 females) were selected to reduce gender bias. Additionally, the random distribution of the invitation in a local public market area helped use reducing socio-economic bias in selecting the participants. However, after a second round of confirmation, only 9 people agreed to participate. Two FGDs were conducted: the first on December 20, 2022, and a follow-up on February 15, 2023. The gap between sessions enhanced data validity and provided additional layers of thick data. FGDs were held in convenient locations such as the Union Parishad complex, school rooms, or other community spaces.

For local government officials, NGO leaders, and civil society organizations leaders, invitations for Key Informant Interviews (KIIs) were extended through direct visits to their offices. Civil society organizations included local clubs and religious associations based on mosques, temples, and churches. Additionally, leaders of local entrepreneurs, proprietors, farmers', and professionals' associations were invited. Participants from the ranks of elected local government representatives were selected based on professional affiliation and gender, while those from the ranks of local government chiefs, Upazila administration, and civil society/NGO heads were selected based on their incumbency in the respective organizations. Sixteen interview participants were recruited—eight from each Upazila—through written and oral invitations. Participants included the Upazila Nirbahi Officer, the Upazila Chairman, two local NGO/non-profit organization executives, and two male and two female elected members of the Upazila Parishad.

In the constructivist grounded theory method, coding and thematic analysis are pivotal for data analysis, aimed at constructing theories grounded in empirical data. As detailed in our methodology, we employed these strategies to analyze the qualitative data collected from focus group discussions (FGDs) and key informant interviews (KIIs). This approach allowed us to systematically identify, analyze, and report patterns within the data, providing deep insights into local governance and climate resilience. Initially, the analysis began with line-by-line coding, where data was meticulously broken down into discrete segments and examined closely. This process involved labeling each segment of data with initial codes that captured its essence. For example, codes were assigned to data segments related to climate disasters, financial, social, technical, and infrastructural support provided by the government and NGOs, discrimination in the distribution of support, community and NGO participation in distribution mechanisms, proactive and reactive measures by local government, and politics surrounding the local government's responsibility in building climate resilience. This thorough engagement with the data ensured that the initial codes were grounded in the participants' experiences and perspectives.

Following initial coding, focused coding was employed to synthesize and explain larger segments of data. This involved selecting the most significant and frequently occurring initial codes to sort and categorize the data more abstractly. Through this process, we identified patterns in how participants described the challenges and successes of local government initiatives. Prominent codes such as "lack of participatory decision-making" and "unsustainable adaptation projects" emerged as central themes, reflecting recurring issues discussed by community members and officials.

Thematic analyses were built on these codes to develop coherent themes that represented the underlying patterns in the data. This involved grouping related codes into broader themes, reviewing and refining these themes to ensure they accurately reflected the data, and defining and naming the themes for clarity. For instance, themes such as "institutional challenges," "community engagement," and "role of NGOs and CSOs" were identified, encapsulating the core issues highlighted in the study. These themes were contextualized within the broader framework of climate change adaptation in coastal Bangladesh, illustrating how local governance practices impact resilience building.

Table 1 Research method to answer the research question

Research question	Data collection	Tools	Respondents	Analysis
How do the most vulnerable areas' citizens find the local government to build adaptive capabilities as part of climate resilience?	FGD	FGD protocol open-ended	Community	Constructivist grounded theory/thematic
	KII	Interview protocol/checklist	Local government Representatives Local civil society organizations/NGOs	Constructivist grounded theory/thematic

Throughout this process, constant comparison was employed to compare data segments within and across interviews and focus groups, ensuring that the emerging theory was consistently grounded in the data. Memos were written during the process to document analytical insights and reflections, facilitating the interpretation of how themes interact and connect across different categories. These memos played a crucial role in understanding the categories generated through line-by-line coding, and in tracking how participants perceived these themes in their real lives.

Using these insights, we explored how coastal area residents perceive the local government's capacity to build climate resilience, informed by interactions between significant findings. This iterative process of data collection and analysis, characteristic of the constructivist grounded theory method, enabled a flexible and responsive approach to understanding the complex dynamics between local governance structures and community resilience efforts in the face of climate change (Table 1).

Findings

Lack of institutional capacity for adaptation in the coastal community

The institutional capacity in the coastal areas of Bangladesh was found to be significantly lacking in climate change adaptation. This deficiency was influenced by several exogenous variables, such as biophysical conditions and community attributes, and endogenous variables, like the rules-in-use and decision-making structures within the community. The deficiencies in institutional capacity were prominent in the communities we focused on in this research.

Exogenous variables, such as coastal geography and climate-related hazards, including flooding, cyclones, and rising sea levels, significantly impacted the communities. Cyclones Sidr and Aila destabilized the soil, weakened the mud walls of houses, and caused extensive damage. Community attributes, such as high poverty levels, inconsistent access to food, and limited financial resources, were significant challenges. Endogenous variables involved informal efforts by community members to repair and rebuild homes and borrow money for survival, highlighting a lack of formal support and coordination from local government institutions.

Most FGD participants reported that their houses could not withstand floods and cyclones, or similar disasters. As one participant from Shyamnagar Upazila noted, "Our houses are made of mud and tree leaves like *golpata*. When the cyclone hits, the walls collapse, and we have nowhere to go." Due to the distance to cyclone shelters, many people remained in their homes during cyclones, resulting in fatalities as the local institutions never provided enough shelters and significantly early warning of disasters. Community members often repaired or rebuilt their homes through individual initiatives, with little institutional or formal support. Regarding food security, participants did not borrow food directly but had to borrow money to buy food. One participant explained, "We don't borrow food; we borrow money to survive, mainly to buy food." Increased household expenditure after disasters led to the mortgaging of properties to buy necessities. Many respondents reported that they could not afford three meals a day year-round, making them highly sensitive to shocks. The destruction of freshwater sources by saline water from cyclones further exacerbated food insecurity, as did damaged road networks, limiting access to food markets. These individual-level incapacities stem from the lack of institutional proactive measures and a lesser degree of utilization of government and donor funds.

Health issues were also significant. Limited access to safe water and proper sanitation after disasters led to malnutrition and increased risks of infections and gastrointestinal problems. Such limited access to safe water was prominent because local institutions did not build deep tube wells or provide access to safe water supply managed by inter-institutional networks. FGD participants mentioned that they do not know which institution is responsible for the help and services needed to build community resilience. This indicates a lack of coordination between organizations and actors within the governance framework.

In the absence of an effective institutional capacity, the coastal community shows significant resiliency organically built within the community to deal with pre-, during, and post-disaster conditions. Community members often take proactive measures, such as building temporary barriers to protect their homes and using traditional knowledge to predict weather patterns and prepare for impending disasters. For instance, some communities have developed informal warning systems to alert others of approaching cyclones, leveraging local networks and communication channels. Participants mentioned that they tried to go to community shelters during the disaster strike, where they shared food and medical aid.

A resident, 'AK,' shared, "We have learned to read the signs of approaching storms by observing the behavior of animals and changes in the wind. This knowledge has been passed down through generations and helps us prepare before the official warnings are issued."

Another resident, 'EN,' highlighted the importance of community solidarity: "During the last cyclone, we all came together to help each other. Those with stronger houses took in families whose homes were damaged. This sense of community is our greatest strength in times of crisis."

The proactive measures taken by community members, supported by traditional knowledge and a strong sense of solidarity, have significantly enhanced the resilience of these coastal communities. By leveraging their resources, fostering community

cooperation, and building on their ancestral knowledge, these communities are better prepared to face the challenges posed by climate change.

Lack of participatory decision-making

From a governance perspective, the lack of participatory decision-making was a significant issue. Exogenous variables included gender disparities and the exclusion of community members from decision-making processes. Endogenous variables involved the decision-making structures within the community. Institutional capacity requires a participatory process to foster food security, income, and healthcare (Jagers and Stripple 2003; Makombe 2013). However, community participation in government projects was negligible. Female FGD participants were particularly vocal about this issue. One female participant, 'YK,' stated, "Females suffer the most. However, the elected representatives and government officials do not ensure female participation for the successful completion of a project." A male participant, 'LK,' added, "Without participation, how would they know what we need after a disaster?"

Local government officials and NGO workers confirmed that community feedback was rarely sought for project planning and implementation. An NGO worker explained, "The central government gives projects to the local government, but those projects never receive any community feedback to incorporate the actual ground-level needs of the people." Political bias in project implementation and resource distribution further excluded community members from benefiting from these projects. One female elected representative, 'SL,' stated, "We, the female members of the institution, are not heard every time, and we observe that the project implementation and resource distribution are done based on political bias, leaving the community out of the loop." Additionally, a female participant, 'YK,' stated, "Females suffer the most. The elected representatives and government officials do not ensure female participation for the successful completion of a project."

Delay in adaptation project implementation

Delays in project implementation were a significant challenge for climate change adaptation projects. These projects aimed to improve the adaptive capacity of the climate change-affected areas this study focused on. Exogenous variables within the IAD framework, such as bureaucratic formalities, political unrest, and reliance on bureaucratic expertise and fund disbursement, were significant issues. Endogenous variables included delays in project start dates and informal communication about project timelines. Bureaucratic formalities, political unrest, and irregularities in fund operations contributed to these delays.

An FGD participant 'MN' said, "Most of the projects did not start on time when they were supposed to. We knew about the project start date from the local NGO workers." A union council chairman under Kalapara Upazila noted, "Project starts get delayed due to bureaucratic formalities, political unrest, and irregularities in fund operation." An NGO worker, 'MS,' added, "Local government institutions heavily rely on bureaucratic expertise and fund disbursement, making the institution handicapped and unable to control project start."

Unsustainable adaptation projects

The sustainability of adaptation projects was a significant concern. Exogenous variables included short-term donor-funded projects without long-term sustainability plans, while endogenous variables involved the outcome evaluation where project activities and interventions were discontinued after completion. Temporary project-based activities often fail to fulfill adaptation targets due to the discontinuation of relevant activities and interventions after project completion. One FGD participant, 'AZ,' said, "They do not come back to get our opinion and see how we are doing. They finish their work and leave. Our constituency's elected members, whether male or female, do not bother to know the impact of the project." This lack of follow-up affected the project's effectiveness and sustainability, as local government institutions did not grasp the impact of implemented projects.

Role of NGOs and CSOs

NGOs and CSOs played a pivotal role in disaster recovery by mobilizing community efforts and providing timely support. Exogenous variables included the community's reliance on NGOs and CBOs for timely support and capacity building. Endogenous variables involved the operational activities of NGOs and CBOs, which often provided immediate support but lacked long-term strategies. NGOs facilitated emergency repairs and improvements in infrastructure and sanitation. One FGD participant, 'MZ,' stated, "We were mobilized by local NGOs and other organizations outside the local government. They mobilized us to initiate timely action for reconstructing damaged houses, roads, culverts, and agricultural land areas we had for our earnings." Community-based organizations (CBOs) created under NGO projects linked various stakeholders, demanded services from government agencies, and provided support to local communities. However, the lack of long-term strategies and coordination mechanisms limited the sustainability of these efforts. One study participant noted, "NGO projects are helpful, but they depend on donor funding, and once the project ends, the support stops."

We identified from the grounded information that these local-level organizations promptly deliver support to the community, as the local government institutions cannot start timely projects due to the constraints and political bias mentioned in previous sections. Our grounded theory-based finding of NGOs and civil society organizations' vital roles is also evident in Hasan et al. (2018), where higher participation in NGO project activities increased the resilience capacities of the people. Although we did not design our study to find any impact of institutional capacity and climate change resiliency, we can still say that NGOs and civil society organizations play a pivotal role as a major alternative force when the community suffers due to the absence of active local government efforts in building capacity.

It was also found that the CBOs created under NGO projects, once activated, provided catalyst support and became linking pins between different stakeholders of these projects, including local bodies, government agencies, and local communities. These CBOs became a force with the facilitation of local NGOs in demanding services from government agencies and local government institutions. They also helped

these institutions when they needed support from the local communities (Hussain et al. 2015).

However, no long-term strategies or organized measures are known to be employed by NGOs and community-based groups. They mostly focused on short-term measures to promote early recovery. Most NGO projects or interventions related to adaptation are initiated according to the development support policy of the donors or development partners. The necessary funds for implementing those projects are also provided by the donors or development partners. Therefore, these adaptation projects are completely dependent on donor funding. However, the project activities and project-created CBOs generally wither away with the completion of the project. Besides, a recent study on the coastal area found some weaknesses in existing NGO coordination mechanisms at the local level, which ultimately create obstacles to achieving aid effectiveness in recovery (Sadik et al. 2018).

Discussion

Our findings illuminate the significant challenges faced by coastal communities in Bangladesh, revealing critical insights into their adaptive capacity, governance structures, and the roles of NGOs and CSOs. By integrating these insights with the existing literature, we construct a grounded theory of institutional capacity for climate change adaptation in vulnerable communities. This theory elucidates the complex interconnections between major findings and provides a comprehensive understanding of how and why certain factors influence community resilience.

The lack of institutional capacity in the coastal communities of Shyamnagar Upazila and Kalapara Upazila underscores the interplay between exogenous and endogenous variables in shaping adaptive responses. Exogenous factors, as represented in the IAD Framework by biophysical characteristics such as coastal geography and climate-related hazards, severely impacted the communities, evidenced by the destruction caused by cyclones Sidr and Aila. These findings align with Baills et al. (2020), who emphasize the heightened vulnerability of coastal areas to climate-induced disasters. Additionally, high poverty levels, inconsistent access to food, and limited financial resources, all attributes of the community within the IAD Framework, further constrained adaptive capacity, supporting Dany et al. (2015), who highlight the necessity of institutional capacity for effective climate adaptation in developing countries.

Endogenous variables, particularly the informal rules-in-use and decision-making structures within the community, further hindered adaptive capacity. According to the IAD Framework, these rules shape the patterns of interaction within the action arena. The absence of formal support from local government institutions forced community members to rely on individual initiatives for survival and recovery, resonating with Rahman (2018), who discusses the adverse effects of corrupt management and lack of formal governance structures on rural communities' adaptation efforts. Specifically, the coastal communities rely on informal warning systems based on traditional knowledge, community solidarity, and mutual support during crises. They use traditional construction practices to build temporary barriers and repair homes, and

informal financial support systems where members borrow money from each other to buy necessities. Collective decision-making and planning are also prevalent, with community groups meeting regularly to discuss disaster preparedness and establishing funds for emergency supplies. However, the community's reliance on borrowing money for survival underscores the economic vulnerabilities that exacerbate their inability to recover from disasters, highlighting the critical need for robust institutional support. The participants' observations about the lack of formal coordination among local institutions and the inability to utilize government and donor funds efficiently indicate systemic governance issues within the action situations of the IAD Framework.

The lack of participatory decision-making within local governance structures emerged as a significant barrier to effective climate adaptation. According to the IAD Framework, the action arena must involve diverse actors in inclusive decision-making processes. Gender disparities and the exclusion of community members from decision-making processes reflect broader issues of inclusivity and governance. Female participants' concerns about their exclusion align with the findings of Coirolo and Rahman (2014) and Rahman (2023), who emphasize the marginalization of vulnerable groups in climate adaptation initiatives. The minimal community participation in government projects, as reported by local officials and NGO workers, supports Shi et al. (2020), who stress the importance of participatory approaches for successful adaptation. Power imbalances within these governance structures exacerbate the situation. Local elites often dominate decision-making processes, marginalizing women and poorer community members who lack the social capital to influence decisions. This imbalance means that the needs and priorities of the most vulnerable populations are often overlooked.

The political bias in project implementation and resource distribution further underscores the need for more transparent and inclusive governance mechanisms within the action situations of the IAD Framework. This finding is consistent with Islam et al. (2017), who argue that local government bodies play a crucial role in shaping adaptive responses and influencing resilience at the grassroots level. The exclusion of community feedback in project planning highlights a top-down approach that fails to address local needs and knowledge, reinforcing the arguments of Jagers and Stripple (2003) and Makombe (2013) for participatory governance.

Delays in the implementation of adaptation projects were a significant impediment to building resilience. The IAD Framework indicates that both exogenous variables, like bureaucratic formalities and political unrest, and endogenous variables, like operational delays and informal communication about project timelines, contribute to these delays, highlighting systemic issues within governance structures. Chu et al. (2019) and Nalau et al. (2021) emphasize the need for flexible and adaptive local institutions to effectively respond to climate change impacts, which is reflected in our findings. As described by participants, the lack of coordination and inefficiencies within local governance structures are necessary for timely interventions for effective disaster recovery and resilience building.

The sustainability of adaptation projects is a major concern, with many initiatives being short-term and donor-funded without long-term plans. This finding aligns with Ford et al. (2020), who stress the need for continuous evaluation and adaptation of

local adaptation plans, represented in the IAD Framework by the evaluative criteria and outcomes. The discontinuation of project activities and interventions post-completion significantly reduces their effectiveness and sustainability, highlighting a critical gap in long-term planning and support. Participants' experiences of abrupt project terminations and the absence of follow-up underscore the importance of sustainable practices. This resonates with the emphasis on the need for integrated and long-term strategies to ensure the lasting impact of adaptation initiatives.

NGOs and CSOs play a pivotal role in disaster recovery and resilience building by mobilizing community efforts and providing timely support. Within the IAD Framework, these actors operate within the action arena, filling critical gaps left by local government intervention. Hasan et al. (2018) highlight the increased resilience capacities through higher participation in NGO project activities, which is evident in our findings. However, the dependency on donor funding and the short-term nature of many NGO projects limit their sustainability, as discussed by Hussain et al. (2015) and Sadik et al. (2018).

Integrating these findings, we propose a grounded theory of institutional capacity for climate change adaptation in vulnerable communities. This theory posits that effective climate adaptation requires a robust interplay between exogenous and endogenous variables within well-structured local-level institutional dynamics as outlined in the IAD Framework. The theory highlights several key points: institutional networks and collaboration, participatory governance, sustainability of adaptation projects, and the role of NGOs and CSOs. Effective adaptation is contingent upon strong institutional networks and collaboration between local governments, NGOs, and private sector actors, supporting Fünfgeld (2015) and Loechel et al. (2013). Inclusive decision-making processes are critical for addressing the needs of vulnerable communities, aligning with Jagers and Stripple (2003) and Makombe (2013). Long-term planning and continuous evaluation, crucial elements within the evaluative criteria of the IAD Framework, are essential for the sustainability of adaptation initiatives, supporting Ford et al. (2020) and Biesbroek et al. (2013). NGOs and CSOs are crucial in bridging the gap left by local government institutions, providing immediate support, and building community capacity. However, their effectiveness is limited by the short-term nature of their interventions and dependency on donor funding.

Overall, this grounded theory emphasizes the need for strengthening local government institutions, fostering inclusive governance, ensuring the sustainability of adaptation efforts, and enhancing the role of NGOs and CSOs in building resilience. By addressing these critical areas, we can improve the adaptive capacity of vulnerable communities in coastal Bangladesh, thereby enhancing their resilience to climate change. This integrated approach, grounded in the IAD Framework, provides a comprehensive understanding of the challenges and opportunities in enhancing local institutional capacity for climate change adaptation, contributing to the broader discourse on sustainable and inclusive climate governance.

Conclusions

The coastal communities of Bangladesh, particularly in Shyamnagar Upazila and Kalapara Upazila, face significant challenges in adapting to climate change. Our study highlights several critical issues. The adaptive capacity of individuals, households, and communities is severely limited by both exogenous factors, such as coastal geography and climate-related hazards, and endogenous factors, such as informal decision-making structures and a lack of formal support. The frequent devastation from cyclones and the resulting economic vulnerabilities underline the urgent need for robust institutional support to enhance resilience.

Institutional dynamics within the governance structures in these areas suffer from significant deficits in participatory decision-making. Gender disparities and the exclusion of community members from project planning and implementation hinder effective adaptation. Ensuring inclusive and participatory decision-making is crucial for addressing local needs and improving project outcomes. Bureaucratic formalities, political unrest, and inefficient fund disbursement processes contribute to significant delays in adaptation project implementation. These delays undermine resilience-building efforts and highlight the need for streamlined and adaptive local institutions capable of timely interventions.

Furthermore, many adaptation initiatives are short-term and donor-funded, lacking long-term sustainability plans. The discontinuation of project activities post-completion significantly reduces their effectiveness. Long-term planning and continuous evaluation are essential for the sustainability of adaptation efforts. NGOs and CSOs play a pivotal role in disaster recovery and resilience building by mobilizing community efforts and providing timely support. However, their interventions are often short-term and dependent on donor funding, limiting their sustainability. Strengthening the coordination mechanisms among NGOs, CSOs, and government institutions is necessary to enhance the impact and sustainability of their efforts.

Despite the lack of institutional capacity, the coastal communities have shown significant resilience by relying on their informal norms and practices. Community members take proactive measures, such as building temporary barriers to protect their homes and using traditional knowledge to predict weather patterns and prepare for impending disasters. For instance, some communities have developed informal warning systems to alert others of approaching cyclones, leveraging local networks and communication channels. The proactive measures taken by community members, supported by traditional knowledge and a strong sense of solidarity, have significantly enhanced the resilience of these coastal communities. By leveraging their resources, fostering community cooperation, and building on their ancestral knowledge, these communities are better prepared to face the challenges posed by climate change.

Based on these findings, several practical applications and policy implications can be made. Strengthening local government institutions through capacity-building programs and ensuring adequate resources are crucial. This includes improving infrastructure, training local officials, and fostering a culture of transparency and accountability. Establishing participatory decision-making processes that actively involve community members, especially marginalized groups such as women, is

essential. Creating platforms for dialogue and collaboration can ensure that local needs and knowledge are incorporated into adaptation strategies. Simplifying bureaucratic procedures and enhancing coordination among different levels of government can reduce delays in project implementation. Adopting flexible and adaptive management practices can also improve responsiveness to changing conditions. Developing long-term sustainability plans for adaptation projects is critical. This involves continuous evaluation, monitoring, and adjustment of project activities to ensure their lasting impact. Encouraging local ownership and involvement in these projects can also enhance their sustainability. Enhancing the coordination mechanisms among NGOs, CSOs, and government institutions can improve the effectiveness of adaptation efforts. Encouraging multi-stakeholder partnerships and long-term planning within NGO projects can help address the dependency on short-term donor funding.

Addressing the challenges posed by climate-induced disasters in Bangladesh requires a comprehensive and coordinated approach involving formal and informal institutions and the affected communities. By prioritizing community engagement, sustainable development planning, and inclusive governance, Bangladesh can enhance its resilience to climate change, mitigate its effects on rural communities, and make significant progress in its battle against poverty. The practical applications and policy implications outlined in this study offer a clear pathway for policymakers and practitioners to strengthen local governance structures and improve the adaptive capacity of vulnerable communities.

Overall, implementing the recommendations from this study can ensure more resilient and sustainable adaptation efforts, ultimately enhancing the well-being and resilience of coastal communities in Bangladesh. This integrated approach, grounded in the findings of our study, provides a comprehensive understanding of the challenges and opportunities in enhancing local institutional capacity for climate change adaptation, contributing to the broader discourse on sustainable and inclusive climate governance.

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Declarations

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