Sustainable Common-Pool Resource Management Through Community-Based Enterprises: A Pathway to Community Resilience in Bangladesh

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Abstract: Community resilience has become a central concept in disaster risk reduction and sustainable development discourse, especially in countries like Bangladesh that face recurring environmental, social, and economic shocks. Despite its increasing prominence, empirical evidence remains limited on how community-based enterprises (CBEs), as collective management mechanisms, can bolster resilience by sustainably governing common-pool resources (CPRs). This study explores how the community-based enterprise model, like the Community-based Enterprise Approach (CEA), contributes to community resilience, thereby bridging the gap between resource governance and the broader discourse on sustainable development. This study adopts a mixed-methods design and incorporates a Randomized Controlled Trial (RCT) to assess the impact of the Community-based Enterprise Approach (CEA) model on community resilience. Communities in the Laksam subdistrict were randomly assigned to either a CEA-implemented intervention group or a non-CEA control group. Due to the absence of a community-scale census in Bangladesh's national statistical framework, we relied on secondary data sourced from the Bangladesh Academy for Rural Development (BARD). Drawing on these data, we constructed a Community Resilience Index (CRI) comprising seven dimensions: resource robustness, social capital, economic development, information and communication, community competence, leadership, and collective action to systematically compare resilience outcomes across the two groups. The analysis reveals a significantly higher CRI score in the CEA area (0.79) compared to the control area (0.47), demonstrating notable improvements in social capital, community competence, and leadership. These results highlight that participatory resource governance, collective decision-making, and local knowledge-sharing under the CEA model contribute to enhanced adaptive capacity. Aligning with Ostrom's design principles and adaptive capacity theory, the findings show that well-managed CPRs can simultaneously promote sustainable livelihoods and resilience building.

Keywords: Sustainable Development; common-pool resource management; Community Resilience; Community-based enterprise

Introduction

Bangladesh is one of the most climate-vulnerable countries in the world, facing frequent and intense natural disasters that pose a significant threat to its people, economy, and environment Mahatabuddin (2024). The Global Climate Risk Index 2021 ranks Bangladesh as the 7th most affected country by climate change from 2000 to 2019[1]. The increasing frequency of extreme weather events, such as floods, cyclones, and rising sea levels, exacerbates existing vulnerabilities in water security, food production, infrastructure, and biodiversity[2]. The economic

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[1] Global Climate Risk Index 2021 — Bangladesh ranked 7th (2000–2019), https://www.germanwatch.org/en/19777
[2] Between 2000–2019, **185 extreme weather events** (floods, cyclones, heatwaves, droughts) were recorded in Bangladesh, https://www.theguardian.com/global-development/2024/feb/28/why-bangladesh-is-running-out-of-options-in-the-face-of-extreme-weather?

burden is also severe, with an estimated annual GDP loss[3] of 1.3% due to climate-induced disasters, which could rise to over 9% by 2100 under extreme scenarios. Furthermore, climate change is expected to displace approximately 19.9 million people internally by 2050[4], creating one of the most significant migration crises in the region.

Given these alarming projections, community resilience has emerged as a crucial concept in mitigating climate risks. Understanding how communities can effectively adapt and recover from climate-induced disasters is essential for sustainable development. One promising approach to enhancing community resilience is through the effective management of common-pool resources (CPRs), a principle outlined by Elinor Ostrom. Bangladesh presents a compelling case study for such an approach, particularly through the Community Enterprise Approach (CEA), successfully implemented in the Daudkandi sub-district of Cumilla for the past three decades.

Despite the increasing focus on climate adaptation strategies, there remains a significant gap in understanding the role of community-driven enterprises in building resilience against climate shocks. Traditional disaster management approaches often emphasize top-down interventions, overlooking local resource governance and community-led adaptation efforts. As a result, many affected communities remain highly vulnerable, lacking sustainable mechanisms to withstand and recover from disasters.

This study addresses the critical question:
How can communities build resilience against climate change through sustainable common-pool resource management and community-based enterprise models?

Specifically, it examines how successful common-pool resource management (CPRs) can contribute to community resilience by ensuring sustainable economic opportunities, resource conservation, and community participation. By analyzing the Community Enterprise Approach (CEA) as an exemplary model, this research explores how such frameworks can be replicated in other vulnerable regions.

The primary objective of this study is to evaluate the effectiveness of community-based enterprises in enhancing community resilience across multiple dimensions. Specifically, the study aims to:

1. Measure and compare community resilience indices between areas where the community-based enterprise, like the CEA model, has been implemented and areas without such interventions.

2. Assess the extent to which key dimensions of resilience, including resource robustness, social capital, economic development, information and communication, community competence, leadership, and collective action, are strengthened through the application of the CEA model.

3. Provide empirical evidence on how locally driven, community-based enterprise initiatives contribute to sustainable and inclusive resilience-building, especially in climate-vulnerable rural contexts like Laksam, Cumilla, Bangladesh.

By addressing these objectives, the study aims to generate insights that can guide policymakers, researchers, and community leaders in designing sustainable, locally-driven adaptation strategies to mitigate climate risks and ensure long-term resilience.

Literature Reviews

Resilience within communities is gaining increased attention as climate change and disaster management grow more urgent. Community resilience describes how well a community can prepare for, respond to, and recover from different types of shocks, including environmental, social, or economic ones (Cutter et al., 2008). Even though more people recognize its value, there is still no single way to measure community resilience. Different researchers and organizations use their own methods, which makes it hard to compare results from different places or studies.

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[3] The average annual cost from tropical cyclones is about USD 1 billion—approximately 0.7–1 percent of GDP, https://www.worldbank.org/en/news/feature/2022/10/31/key-highlights-country-climate-and-development-report-for-bangladesh?

[4] World Bank predicts 19.9 million internal climate migrants by 2050, https://www.migrationpolicy.org/article/bangladesh-india-climate-migration?

Several organizations and scholars have attempted to develop frameworks to assess resilience. These frameworks vary in scope and methodology, with some focusing on quantitative indicators and others emphasizing qualitative community experiences.

P. Longstaff et al. (2010) introduced an early framework for evaluating community resilience. This framework follows Elinor Ostrom's idea of using frameworks to organize and guide the study of complex systems. It highlights important features of resilient systems, such as resource performance, diversity, redundancy, institutional memory, innovative learning, and connectedness, within five main community areas: ecological, economic, physical infrastructure, civil society, and governance. Although the framework is conceptually strong, its lack of real-world application examples makes it more difficult for practitioners to implement effectively.

Cutter, Burton, and Emrich (2010) present a methodology and a set of indicators to capture baseline community resilience. They introduce a "composite indicator" by combining several variables into an aggregate measure. Their framework has five subcomponents: social, economic, institutional, infrastructural, and community elements. It deliberately excludes ecological resilience. The analysis includes thirty-six variables, with each subcomponent using seven to eight variables from public sources. The approach provides a structured way to assess resilience, but it is not fully quantitative and lacks validation through real-life case studies.

Norris et al. (2008) present a theory of resilience that integrates contemporary understandings of stress, adaptation, wellness, and resource dynamics. They define community resilience as a process that connects a set of adaptive capacities to a positive trajectory of functioning and adaptation following a disturbance. Building on this definition, Norris et al. (2008) identify four primary sets of adaptive capacities from which community resilience arises: Economic Development, Social Capital, Information and Communication, and Community Competence. Together, these capacities provide a strategic foundation for disaster preparedness. Of these, social capital and community competence are most pertinent to resilience at the community level. Drawing on literature across multiple disciplines, Norris et al. synthesize key terms and concepts into a coherent theoretical model of community resilience, thereby bridging disparate perspectives into a unified framework.

Pfefferbaum, Van Horn, and Pfefferbaum (2017) present a framework for building community resilience by focusing on social capital. Their research suggests that strong social connections and networks help boost both personal and community resilience. They note that different methods have been used to identify what makes communities resilient, often focusing on resources, social ties, information sharing, and the ability to learn and adapt together. However, these methods typically describe processes or factors without providing standardized metrics or measurement tools, making the framework challenging to apply in practice.

Ross and Berkes (2014) examine research methods that help us better understand and improve community resilience. They focus on participatory research and advancing ways to monitor resilience. They note that there is no single, widely accepted method for studying community resilience. Most studies use mixed methods, such as case studies and interviews. These approaches provide valuable insights but make it hard to compare results or apply them broadly. Some researchers believe resilience is difficult to measure directly. It often depends on future events and specific contexts (Carpenter et al. 2005). To address these issues, Ross and Berkes (2014) suggest refining current methods and trying new ones. They also support participatory action research. They stress the importance of involving communities in learning what makes them resilient. This involvement can promote social learning, which is an important part of resilience (Wilson 2012). Still, they point out that while participatory approaches help local learning, they often do not offer a clear, quantitative way to track or compare resilience across different places or over time.

To sum up the literature discussed above, most existing studies have attempted to conceptualize community resilience and relied predominantly on qualitative analyses. In contrast, this study aims to advance both theoretical and quantitative approaches. While our primary focus is on the theoretical dimensions of community resilience, we also incorporate a case study to illustrate a real-life scenario, thereby providing practical evidence alongside our conceptual framework.

Understanding the Concept: Definitions, Measurement, and Key Determinants

Defining Resilience

Policymakers, practitioners, and academic researchers agree that resilience plays a key role in assessing how prepared critical infrastructure owners, operators, communities, regions, and the Nation are to respond to and recover from threats (Carlson et al. 2012). Despite this consensus, there is no agreement on some key issues, such as the definition, evaluation, and measurement of resilience. Before discussing the theoretical aspects, it is essential to clearly define resilience. Therefore, this section explores ways to assess resilience at the community and regional levels.

The definition of resilience varies considerably across the literature. Broadly, it is described as an entity's capacity to recover from natural or human-made threats Norris et al. (2008). To capture these diverse interpretations, we can recognize a set of resistance- and anticipation-related behaviors that are undertaken with the expectation of adverse events(P. Longstaff et al. 2010). These proactive behaviors are an integral part of resilience, as they help reduce both the immediate and long-term impacts of disturbances.

Recognizing these proactive, forward-looking actions as key parts of resilience helps us develop a clearer framework. Resilience is the ability of an asset, organization, community, or region to anticipate, resist, absorb, respond, adapt, and recover from disruption[5]. This definition shapes how we measure and assess resilience. The literature offers many interpretations, but it is helpful to group them into three main types: general resilience, infrastructural resilience, and community resilience (Cutter et al. 2008).

Resilience in General

Resilience is generally understood as a system's ability to survive, adapt, and grow when faced with change and uncertainty (Fiksel 2006). P. H. Longstaff et al. (2010) describe resilience as a system's capacity to absorb disturbances, adapt, and maintain its core functions and structure, though their focus is mainly on what happens after an event. Some definitions, like (Gilbert 2016) include both before and after a disruptive event, describing resilience as the ability to reduce disaster costs, recover to a previous or better state quickly, and withstand hazards with minimal harm. In this essay, resilience means both resisting challenges and recovering from setbacks.

Defining Infrastructure Resilience

Infrastructure resilience, also known as organizational resilience (Stephenson, 2010), is important on its own and for helping communities and regions become stronger. The National Infrastructure Advisory Council (2009) defines infrastructure resilience as the ability to lessen the size, impact, or length of a disruption. This includes being able to handle shocks, adjust to new situations, and recover quickly from events that could cause problems[6]. Communities heavily rely on the services, functions, and employment provided by organizations to effectively prepare for, respond to, and recover from disasters and crises (Stephenson et al. 2010). In this sense, community and organizational resilience are deeply interconnected; a community cannot be fully resilient if its critical organizations cannot manage crises.

Defining Community Resilience

When managing risk at the local level, it is important to consider both how well a community can recover from disruptive events and the risks to essential infrastructure. Community resilience can be measured to assess these factors. However, there is debate about whether actions taken before an event, like resistance, protection, anticipation, and preparedness, should be part of the definition and measurement of community resilience. This debate is similar to discussions about how to define and measure infrastructure resilience and resilience in general.

P. H. Longstaff et al. (2010) define community resilience as a system's ability to handle disruption and change while keeping its core identity, structure, functions, and feedback. Resilience means a community can continue its main operations during disruptions. Paton (2007) describes community resilience as the ability of a community, its members, and supporting systems to adapt and maintain their usual relationships when facing major challenges.

According to the National Research Council (2011), a disaster-resilient nation is one where communities use mitigation and preparation before disasters to build the ability to keep essential functions going and recover quickly after major events.

Synthesizing Different Definitions

The main difference between the definitions of resilience mentioned earlier is whether interventions occur before an adverse event happens or after its effects are experienced. Most of the sources reviewed describe resilience as the ability of an entity to recover from the negative effects of a natural or human-caused disturbance (Cutter et al. 2008).These studies often imply either explicitly or implicitly that resilience pertains primarily to post-event recovery, thereby overlooking proactive measures taken before a hazard, such as those associated with resistance, protection, anticipation, and preparedness. Instead, these proactive measures (e.g. resistance, safety, anticipation, and

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[5] Paton, D. & Johnston, D. (2001). Disasters and communities: vulnerability, resilience and preparedness. *Disaster Prevention and Management*, 10(4), 270–277.

[6] https://www.cisa.gov/sites/default/files/publications/niac-critical-infrastructure-resilience-final-report-09-08-09-508.pdf(NIAC Report 2009)

preparedness) and reactive responses (e.g. recovery and adaptation) are recognized as distinct yet complementary elements of a broader, holistic risk management strategy(Norris et al. 2008).

Assessment and Measuring Resilience

Measuring resilience across different scales ranging from critical infrastructure to entire communities or regions poses considerable methodological and practical challenges. While resilience at the infrastructure level often focuses on the performance and recovery of specific assets or facilities, assessments at broader, systemic levels introduce greater complexity. As the scale of analysis shifts from individual components to aggregated systems such as communities or regions, resilience becomes increasingly difficult to quantify. This is primarily due to the multidimensional and interdependent nature of the factors involved, many of which, such as social cohesion, psychological well-being, and institutional capacity, are not easily captured through conventional metrics[7].

Moreover, substantial data gaps exist, especially for sociological and psychological variables that significantly influence community-level resilience(Norris et al. 2008). These gaps are compounded by uncertainties surrounding the causal relationships among resilience determinants, further complicating the development of standardized and comparable assessment tools[8]. Financial and temporal constraints often limit the feasibility of conducting large-scale, comprehensive resilience evaluations. Consequently, the disconnect between theoretical frameworks and practical assessment grows wider as research moves beyond tangible infrastructure resilience toward the more abstract and multidimensional concept of community or regional resilience[9].

In response to these challenges, this section concentrates on understanding and assessing community resilience through a Community-Based Enterprise Approach (CEA) an approach that emphasizes local participation, collective governance, and adaptive capacity as key drivers of resilience at the grassroots level(Magis 2010).

A Community-Based Approach

Resilience can be developed in many ways, but focusing on the community level is especially important (P. H. Longstaff et al. 2010). Most disasters happen locally and affect each community differently. Each community has its own needs, resources, experiences, and views on how to prevent, respond to, and recover from disasters. Groups can make decisions and use resources that individuals alone cannot.

A community is made up of people who share the same environment, resources, and services, as well as similar risks. It has clear boundaries, receives feedback from inside and outside, and shares a common future. Because of this, a community is a complex system with many parts. Community or regional resilience depends on five main areas: the local economy, critical infrastructure, government and institutions, the people who live there, and supply chains (Carlson et al. 2012). Building resilience works best at the community level, where local needs, knowledge, and resources support flexible disaster responses. While larger organizations and governments provide important help, communities are key to resilience planning by promoting local involvement and cooperation among public, private, and nonprofit groups. This approach not only strengthens local resilience but also improves preparedness at larger scales.

Determinants of Community Resilience

Community resilience involves many different factors, including social, economic, institutional, and environmental influences. It is not a fixed trait, but instead shows how well a community can prepare for, respond to, and recover from challenges. Based on the literature (Buikstra et al. 2010; P. Longstaff et al. 2010; Matarrita-Cascante et al. 2017a; Norris et al. 2008), the main factors that shape community resilience are widely agreed upon:

Resource Robustness

Resource robustness means having enough important resources—like natural, economic, and social assets—that help communities keep working and adjust during tough times. These resources include physical infrastructure,

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[7] Cutter, S. L. (2016). Resilience to what? Resilience for whom? Critical reflections on the resilience concept. *The Geographical Journal*, 182(2), 110–113. https://doi.org/10.1111/geoj.12174

[8] Paton, D. (2007). Measuring and monitoring resilience in Auckland. *GNS Science Report*, 2007/18. Retrieved from https://www.gns.cri.nz/static/download/media/2007-18-paton.pdf

[9] Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American Behavioral Scientist*, 59(2), 254–269. https://doi.org/10.1177/0002764214550299

environmental assets, and systems that provide backup and flexibility when things go wrong (P. Longstaff et al. 2010; Norris et al. 2008).

Social Capital

Social capital refers to the networks of trust, mutual support, and shared values that help people work together in a community. It covers informal connections like family and neighbors, as well as formal groups such as community organizations. These networks often provide important support during emergencies. Research shows that communities with strong social capital tend to recover more quickly, have more active civic participation, and experience better mental health (Aldrich 2012; Buikstra et al. 2010). High levels of social capital are associated with faster recovery, stronger civic engagement, and improved mental health outcomes.

Economic Development and Stability

A resilient community requires a robust and diverse local economy capable of withstanding external shocks. Key economic determinants include income diversity, employment opportunities, equitable access to financial resources, and local market connectivity. (Cutter, Burton, and Emrich 2010; Maclean, Cuthill, and Ross 2014). Economic stability provides the financial means for individuals and households to invest in preparedness, cope with loss, and recover efficiently.

Information and Communication

Effective communication systems and access to reliable, timely information are critical for resilience. These systems support informed decision-making, early warning dissemination, and collective awareness during disruptions. Resilient communities often possess strong local media, trusted knowledge-sharing networks, and mechanisms for transparent communication (Buikstra et al. 2010; Norris et al. 2008)

Community Competence

Community competence refers to a community's capacity to collectively identify problems, reflect critically, solve challenges, and adapt to change. It includes skills such as leadership, planning, conflict resolution, and participatory governance. Competent communities demonstrate flexibility and creativity in their responses to stressors, drawing on local knowledge and social learning (Davidson 2010; Magis 2010).

Active Agents and Leadership

Leadership plays a central role in mobilizing resources, coordinating actions, and sustaining community momentum during crises. Effective leaders, whether formal or informal, act as facilitators of trust, vision, and participation. Their legitimacy, responsiveness, and ability to foster collaboration are key to enabling community resilience. (Buikstra et al. 2010; Magis 2010)

Participation and Collective Action

Widespread participation and inclusive decision-making processes strengthen resilience by ensuring that diverse voices are heard and community members have a stake in local outcomes. Collective action builds social cohesion and fosters shared responsibility for addressing risks and recovering from disasters. (Kulig et al. 2013; Norris et al. 2008). Participation also enhances transparency, accountability, and innovation in community problem-solving.

These determinants are not isolated components but interconnected adaptive capacities that reinforce one another. For instance, strong social capital can enhance participation and leadership, while economic stability may facilitate investments in communication infrastructure and resource sustainability. Thus, resilience emerges not merely from the presence of individual factors but from the strength and synergy of these dimensions operating together within a community system. The Community-Based Enterprise Approach (CEA), as explored in this study, offers a practical model that integrates these determinants into a cohesive strategy for resilience-building, particularly in vulnerable rural contexts.

Resilience from the Commons: Community Enterprise and the Management of Floodplain Resources in Bangladesh

Common-pool resources (CPRs), such as fisheries, forests, pastures, and water bodies, have always been difficult to manage because of their unique features. Since it is hard to stop people from using them and each person's use reduces what is left for others, CPRs are often overused if there are no rules. Early economists, including Gordon in his study of fisheries, argued that when everyone has free access to resources, they are used up faster than they can be replenished. Garrett Hardin made this point well in his essay, "The Tragedy of the Commons." He claimed that unless outside forces, such as government rules or private ownership, intervene, people acting in their own interest will

deplete shared resources, harming everyone. Hardin suggested that the solution is for people to agree on rules that are enforced by a central authority or through the market.

However, in the decades that followed, these prescriptions were increasingly challenged by empirical observations. Field studies from diverse parts of the world began to show that neither state control nor privatization reliably ensured sustainable outcomes[10]. In many developing countries, state interventions often dismantled longstanding indigenous stewardship systems without providing adequate monitoring or enforcement capacity. Similarly, privatization frequently proved infeasible due to the resources' biophysical traits or led to inequities when commercial interests overshadowed sustainability goals[11]. The failures of these top-down models created space for alternative approaches, most notably the work of Elinor Ostrom, who documented numerous examples of local communities that successfully managed CPRs through self-organization[12].

Ostrom's pioneering book, Governing the Commons, showed that communities could design robust institutions to manage CPRs sustainably. Contrary to Hardin's premise of inevitable tragedy, Ostrom found that resource users, especially those with long-term stakes and strong interdependence, were capable of cooperating to establish monitoring protocols, devise fair allocation rules, and enforce collective decisions[13]. She outlined eight design principles characterizing successful community-based CPR institutions and subsequently introduced the Social-Ecological Systems (SES) framework to analyze the multi-tiered nature of CPRs[14]. This shift in theoretical understanding from an inevitability of collapse to a recognition of conditional possibility laid the groundwork for more nuanced approaches to CPR governance.

One such alternative that has proven successful is the Community Enterprise Approach (CEA), pioneered by the national NGO SHISUK (Shikkha Shastha Unnayan Karzakram) in Bangladesh. CEA integrates cooperative governance with enterprise principles by mobilizing entire communities to establish democratically run business entities owned and managed collectively by residents[15]. Unlike models that empower only a few elite actors, CEA emphasizes broad participation, aligning individual incentives with collective well-being and ensuring that members act not merely as beneficiaries but as shareholders, decision-makers, and entrepreneurs.

The application of CEA in the floodplain regions of Daudkandi, a sub-district in Bangladesh's Comilla district, is a testament to its potential. These areas experience seasonal monsoon flooding that submerges agricultural land for several months annually. Previously considered unproductive during these periods, these waterlogged lands were transformed into thriving aquaculture enterprises under SHISUK's initiative. Communities began to manage floodplains as large, cooperative fish farming projects. Community members became shareholders and elected boards to oversee day-to-day management. SHISUK acted as a facilitator, providing technical guidance and creating spaces for dialogue but allowing the communities themselves to drive decisions and innovations.

The results have been transformative. From once-idle floodplains, Daudkandi now produces over 25,000 metric tons of fish annually, with productivity exceeding four metric tons per hectare. Beyond economic returns, these enterprises have also yielded substantial social benefits: improving local nutrition, strengthening participatory governance, fostering gender equity, and enhancing social cohesion and community resilience[16].

This resilience was put to a severe test during the devastating flash floods of August 2024. Intense rainfall over Tripura, India, led to the rapid swelling of the Muhuri and Gumti Rivers. Unlike the distant Ganges or Teesta basins, these rivers lie only about 100 kilometers away and have narrow channels, leaving little time for warnings. Within days (August 19–22), rainfall exceeded 435 mm in Feni, 557 mm in Comilla, and 605 mm in Noakhali[17]. Laksham Upazila, home to SHISUK-supported aquaculture projects, was severely impacted, with fish farms, hatcheries, and protective

[10] Ostrom, E. (2000). "Reformulating the Commons," *Swiss Journal of Economics and Statistics*, 136(1), 1–24.

[11] Agrawal, A. & Gibson, C. C. (1999). "Enchantment and disenchantment: The role of community in natural resource conservation," *World Development*, 27(4), 629–649.

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[13] Ostrom, E. (2009). "A General Framework for Analyzing Sustainability of Social-Ecological Systems," *Science*, 325(5939), 419–422.

[14] Ostrom, E. (2007). "A diagnostic approach for going beyond panaceas," *Proceedings of the National Academy of Sciences*, 104(39), 15181–15187.

[15] SHISUK Annual Report (2021). *Community Enterprise Aquaculture in Daudkandi Floodplains*.

[16] Rahman, M. et al. (2022). "Socio-economic impacts of community-managed floodplain aquaculture," *Bangladesh Development Studies*, 46(3), 37–62.

[17] Bangladesh Meteorological Department (2024). "Flood Report: August 2024.

infrastructure submerged. Early estimates from the fisheries office put losses at over Tk 400 crore, threatening thousands of livelihoods across one municipality and seven unions[18].

Initially, most individual fish farmers assumed that basic protective measures, like net fencing, would suffice. But as water levels surged and submerged nets and access roads, it became evident that these isolated efforts were inadequate. Individual farmers struggled to respond due to labor shortages, limited coordination, and lack of resources.

By contrast, community-based aquaculture enterprises activated collective action. Leaders from cooperative initiatives including Echapura, Rupali, Atakora-Mijiapara, and SP Floodplain Aquaculture coordinated rapidly with SHISUK and the Bangladesh Academy for Rural Development (BARD) to mobilize labor and resources. Community members worked together to reinforce fencing, strategically distribute feed to attract fish into safe enclosures, and coordinate repair and monitoring schedules. The Isapura project's successful strategy was quickly adopted by neighboring initiatives, allowing them to minimize losses and protect their fish stocks. The rapid, cooperative response exemplified the resilience that emerges when resource management is grounded in community participation.

What might have been a devastating collapse became a powerful demonstration of collective resilience. Shared ownership of the aquaculture enterprises created strong incentives for rapid and coordinated action. Community members took rotating shifts to monitor fish pens, prevent theft, repair damaged barriers, and support one another. Crucially, these protective measures were not imposed from outside; they arose organically from existing relationships, trust, and the participatory governance structure, exactly the kind of self-organization and institutional robustness described by Ostrom[19].

The Laksham experience illustrates that collective action and local leadership can turn a natural disaster into an opportunity for resilience-building. Individual fishers were vulnerable, but cooperative enterprise enabled them to reduce losses, protect their shared assets, and emerge with a stronger sense of solidarity and adaptive capacity. The lessons are clear: sustainability in CPRs is not simply a technical issue; it is fundamentally institutional and social. When communities are trusted, properly supported, and organized, they can manage shared resources sustainably even in the face of intensifying climate shocks.

In conclusion, SHISUK's Community Enterprise Approach to floodplain aquaculture in Bangladesh offers a powerful counter-narrative to Hardin's tragedy of the commons. It supports the evolving understanding in CPRM literature that local communities, when given the autonomy and institutional backing they need, can manage their common resources judiciously[20]. In a world facing increasing climate volatility, such cooperative and community-driven models will be critical for fostering resilience, equity, and sustainability.

Conceptual Framework

A review of the literature on community resilience shows that, although creating composite indicators is seen as important for measuring disaster resilience, there is no single standard tool or index for this purpose. Researchers from different fields have studied resilience in systems of various sizes and from a range of viewpoints. Resilience is not considered a separate trait; it depends on the factors that shape it and the results it leads to. Because of this, any framework should include the elements that help build community resilience. Authors have used different terms to describe the ideas that influence community resilience. To properly assess how local communities respond to natural disasters, it is important to have a clear framework to guide the analysis. This study begins by examining several ways to define community resilience, and Table 1 summarizes the main factors found in the literature.

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[18] Department of Fisheries (2024). "Post-Flood Damage Assessment Report," Government of Bangladesh

[19] Wilson, G. A. (2012). *Community Resilience and Environmental Transitions*. Routledge.

[20] Ostrom, E. (2010). "Beyond Markets and States: Polycentric Governance of Complex Economic Systems," *American Economic Review*, 100(3), 641–672.

Table 1. Key factors to conceptualize the community resilience (Matarrita-Cascante et al. 2017b)

Factor	Author, Year	Desired Condition for Resilience
Economic development/stability	(Norris et al. 2008); Gooch, Rigano, Butler, and Cullen (2010); (Maclean, Cuthill, and Ross 2014)	A robust and diverse state of the local economy
Social capital/networks	(Buikstra et al. 2010); (Norris et al. 2008); (Maclean, Cuthill, and Ross 2014)	Strong and meaningful social relations and connections
Information/communication/knowledge/skills	Gooch et al. (2010); (Maclean, Cuthill, and Ross 2014)	Available information, knowledge, and an efficient mechanism for communicating and sharing them
Community competence/agency	(Norris et al. 2008);(Magis 2010); (Davidson 2010); (Matarrita-Cascante et al. 2017c)	Existing ability to learn and work together flexibly and creatively towards the overall community goal
Active agents/leaders	(Buikstra et al. 2010; Magis 2010)	Presence of numerous, diverse, and responsible individuals/organizations leading efforts
Participation/collective action	(Magis 2010); (Kulig et al. 2013)	Existing and broad involvement of community members

Table 2. Key factors of community resilience: definitions, core indicators, and supporting references

Dimensions	Definition	Core Indicators	References
Resource Robustness	The availability, diversity, and sustainability of key community resources—natural, economic, and social—that support basic needs and enable adaptive responses to shocks or long-term stresses.	Performance, Diversity, and Redundancy	(P. Longstaff et al. 2010); (Norris et al. 2008)
Social Capital	Social capital is the web of trust-based relationships and shared norms within a community that enables collective action and resource mobilization during times of crisis.	Received and perceived social support, social embeddedness (informal ties), organizational linkages and cooperation, citizen participation, leadership and roles (formal ties), sense of community	(Norris et al. 2008); (Buikstra et al. 2010); (Aldrich 2012)
Economic Development/Stability	Economic development refers to the growth, diversification, and stability of local economic systems that enable a community to withstand, adapt to, and recover from disruptions, such as natural disasters, economic shocks, or social upheaval.	level and diversity of economic resources, equity of resource distribution	(Cutter, Burton, and Emrich 2010; Maclean, Cuthill, and Ross 2014; Norris et al. 2008)
Information and Communication	The systems and processes that ensure timely, accurate, and accessible information sharing, enabling communities to make informed decisions and act collectively during crises.	Narratives, responsible media, skills, and infrastructure, trusted sources of information.	(Buikstra et al. 2010; Norris et al. 2008)

Community Competence	The collective capacity of a community to learn, make decisions, and act together effectively to address challenges, adapt to change, and pursue shared goals.	Community action, critical reflection and problem-solving skills, flexibility and creativity, collective efficacy and empowerment, political partnerships	(Davidson 2010; Magis 2010; Norris et al. 2008)
Active agents/leaders	Individuals or groups within the community who take initiative, mobilize resources, and guide collective action play a crucial role in building resilience and adaptive responses.	Trust and legitimacy, capacity to mobilize resources, communication, and coordination skills	(Buikstra et al. 2010; Magis 2010);
Participation/collective action	The broad involvement of community members in decision-making and coordinated efforts strengthens social cohesion, enhancing the community's ability to respond to and recover from disruptions.	Inclusive engagement, shared decision-making, Social Cohesion and Solidarity, Institutional Support	(Kulig et al. 2013; Magis 2010; Norris et al. 2008)

This table gives a clear summary of the main factors that make up community resilience. It brings together accepted definitions, ways to measure progress, and trusted sources. Each factor highlights an important area—social, economic, institutional, or informational—that helps communities prepare for, respond to, and recover from challenges. Based on research from different fields, the table is meant to help scholars, development workers, and policymakers who want to assess, improve, or create programs focused on resilience.

The concepts discussed above share numerous similarities, differences, and limitations. Some key points to note are that these factors do not directly measure resilience, but their presence can enhance the resilience of local communities (Pazhuhan and Amirzadeh 2024). Secondly, research indicates that these factors are closely interconnected. Ultimately, these factors vary in their roles and features; some are static, others are dynamic; certain ones are core elements, whereas others function as supporting elements or catalysts.

In our framework, community resilience comes from a set of adaptive abilities. More specifically, it is based on a network of connected adaptive capacities (P. Longstaff et al. 2010; Norris et al. 2008). This is important because resilience relies not just on resources, but also on how robust, redundant, and quick they are. We call this group of qualities 'adaptive capacities'. We refer to this combined concept as "adaptive capacities." This perspective aligns with (Gunderson 2000) definition of adaptive capacity as the ecosystem's ability to change, stability, and resilience. Its transformative nature sets "community resilience" apart from other notions of community strengths, like "community competence" or "social capital" (Brown and (Kulig et al. 2013); (Pfefferbaum, Van Horn, and Pfefferbaum 2017), which are considered resources more precisely, collections of resources.

Within this framework, we investigate the existence of any interaction between Community resilience and the CEA model that affirms how CEA inherently promotes community resilience. The Community-Based Enterprise Approach (CEA) helps build stronger, more resilient communities by focusing on local resources, encouraging active participation, and fostering teamwork. Its goal is to enhance the community's ability to withstand, adapt to, and recover from environmental, social, or economic challenges. Table 3 illustrates the Conceptualization of the CEA model and its promotion of community resilience.

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Table 3: Conceptualization of CEA Model

Dimension	How CEA Promotes Resilience	Key References
Social Capital	Trust, norms, networks, collective action	(Ahmad 2003; Islam and Dickson 2007)
Economic Stability	Income diversification, Employment creation,	(Yamin Bayazid 2016; Faiaz, Sustainable, and 2020 n.d.; Hossain et al. n.d.)
Adaptive Capacity	Local knowledge, innovation	Folke (2006); Armitage et al. (2009)
Resource Sustainability	Community resource governance	(Yamin Bayazid 2016; Ostrom 1990)
Institutional Robustness	Local rules, monitoring	(Yamin Bayazid 2016; Ostrom 1990)
Risk Management	Collective protection and recovery	Walker et al. (2004); SHISUK (2024)
Political Empowerment	Voice, policy engagement	(Khan 2015)

Can CEA Strengthen Community Resilience? Exploring the Evidence

We examine how community resilience is strengthened through the mechanisms embedded within the Community-based Enterprise approach (CEA) model. CEA contributes to community resilience both directly and indirectly by fostering sustainable, collective, and adaptive practices. One critical dimension of community resilience is resource robustness, which refers to the capacity of natural resources to withstand and recover from external shocks and pressures. The CEA model enhances this robustness through integrated strategies such as sustainable resource use, collective monitoring, and the establishment of robust institutional arrangements (Y Bayazid et al. n.d.; Ostrom 1990)

The CEA model follows the key principles for managing common-pool resources sustainably, as described by Ostrom and confirmed in Bangladesh by (Yamin Bayazid 2016). By meeting criteria like clear boundaries, shared rule-making, monitoring, and step-by-step sanctions, the CEA model supports sustainable resource management. This approach helps make resources more robust, which is essential for long-term community resilience.

In terms of social capital, a vital component of community resilience, the CEA model significantly contributes to its development and reinforcement. Social capital encompasses elements such as trust, shared norms, social networks, and the capacity for collective action (Ahmad 2003). The effectiveness of the CEA model fundamentally relies on trust that community members willingly participate in and financially contribute to the initiative because they believe in its transparency, fairness, and collective benefits.

Moreover, the model actively fosters social cohesion by bringing diverse community members together under a shared economic and ecological agenda. This not only strengthens interpersonal and institutional networks but also enhances the community's ability to work collaboratively. As a result, the CEA model helps to mitigate local tensions and reduce conflict, further reinforcing the cooperative and resilient nature of the community.

The CEA model also plays a critical role in promoting economic development and stability by diversifying income sources and generating employment through its forward and backward linkages (Faiaz, Sustainable, and 2020 n.d.). In the Daudkandi region of Bangladesh, where the CEA model has been implemented over the past two decades, its integration into floodplain aquaculture has significantly transformed local livelihoods. Before the introduction of CEA, the region's economy largely depended on a single crop, paddy cultivation during the dry season. However, with the adoption of the CEA model, communities have been able to utilize the same floodplain areas for aquaculture during the monsoon season, thereby creating a dual-income system.
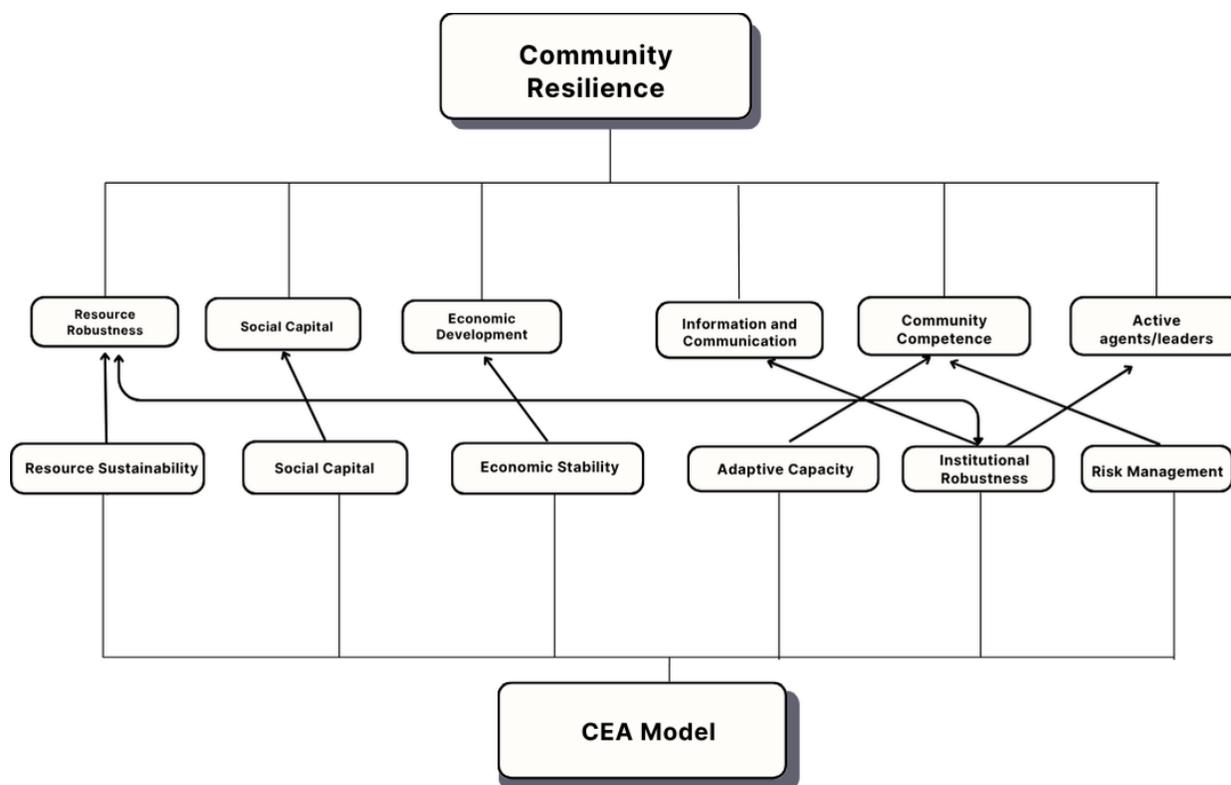
Figure 1: The Framework illustrating how the CEA Model enhances community resilience through its mechanism.

This seasonal diversification not only increases household income and food security but also reduces economic vulnerability to climate and market shocks. Furthermore, the model stimulates local employment by creating demand across the aquaculture value chain from hatcheries, feed supply, and transportation (backward linkages) to fish processing, marketing, and distribution (forward linkages). Thus, CEA catalyzes inclusive and resilient local economic growth.

SHISUK, the pioneer of the Community-based Enterprise Approach (CEA) model, actively contributes to strengthening community competence in the Daudkandi region. Community competence refers to the capacity of a community to collectively identify challenges, mobilize resources, and implement effective responses. SHISUK fosters this capacity by creating inclusive platforms that bring people together, encouraging dialogue, cooperation, and joint decision-making.

One of the key ways SHISUK promotes community competence is through skills development and training initiatives, equipping individuals with the knowledge and capabilities necessary to participate effectively in aquaculture and related value chains. Moreover, it places strong emphasis on empowering marginalized and vulnerable groups, particularly women, by involving them in decision-making processes and income-generating activities within the CEA framework. By mobilizing community members for collective action and enhancing their ability to respond proactively to social and economic challenges, SHISUK, through the CEA model, substantially improves the community's overall competence and adaptive capacity.

Within the CEA model, SHISUK functions as an active institutional leader, taking initiative, mobilizing resources, and guiding collective action, thereby playing a pivotal role in fostering community resilience and adaptive capacity (Y Bayazid et al. n.d.). As a catalytic agent, SHISUK not only facilitates the organizational framework for community participation but also ensures sustained coordination and innovation in response to emerging social, economic, and environmental challenges.

Our conceptual analysis reveals that the CEA model inherently embeds mechanisms that strengthen community resilience. This built-in synergy between community enterprise and resilience is both innovative and highly relevant in today's context of increasing social and environmental challenges.

Methodology

Study Area

This study was conducted in the Laksam sub-district of the Cumilla district, Bangladesh, where three Community Enterprise Aquaculture (CEA) projects are currently being implemented. These projects are located within two unions—Uttarda Union and Gobindapur Union. Near these project sites lies a control area where no CEA-based aquaculture activities take place, allowing for comparative analysis.

Geographically, Laksam is located at 23°12′ N latitude and 91°8′ E longitude, with an elevation of approximately 9 meters (30 feet) above sea level. Figure 2 illustrates the location of the Laksam sub-district within the Cumilla district, highlighting the designated study area. The local climate is generally warm and humid, characterized by frequent rainfall and thunderstorms, which contribute to the area's vulnerability to seasonal flooding. The Cumilla district shares a border with the Indian state of Tripura, a hilly region from which the Gomti River, often considered the lifeline of Cumilla, originates. Tripura, being at a higher elevation than Cumilla, plays a crucial role in the region's hydrological dynamics. In 2024, a severe cloudburst occurred in Tripura and its neighboring areas, resulting in catastrophic flooding that affected several regions downstream, including parts of Laksam.

Figure 2: The study area (Under project & outside project) indicated by the yellow shaded area (Uttarda & Gabindapur unions) in Laksam Sub-district of Cumilla district in Bangladesh.

Characteristics of the Community in Laksam

Demographics and Settlement Patterns:
Laksam Upazila, located in Cumilla District of southeastern Bangladesh, is densely populated with both rural and peri-urban settlements. The majority of the population is Muslim, accompanied by a small Hindu minority. The literacy rate is steadily increasing, particularly among the younger generation, although rural educational outcomes remain below national averages.

Livelihoods and Economic Base:
Agriculture remains the backbone of the local economy, supported by fertile alluvial soils. A significant portion of the population engages in rice farming, vegetable cultivation, and smallholder poultry. Community-based and

individual aquaculture have emerged as critical livelihood sources, especially in flood-prone areas. Overseas migration is common, and remittance flows are vital to household income security.

Ecological and Environmental Context:
Laksam lies within a seasonal floodplain of the lower Meghna River basin. The region experiences annual monsoon flooding and prolonged waterlogging, shaping both risks and opportunities for livelihoods. While these waters nourish fisheries and recharge ecosystems, flash floods have intensified due to changing climate patterns and siltation of drainage canals. Groundwater pressure is rising due to irrigation demands, raising long-term sustainability concerns.

Infrastructure and Basic Services:
Laksam benefits from growing transport connectivity, especially due to its railway junction. However, rural infrastructure such as embankments, drainage systems, and health facilities requires further improvement. Electricity coverage has expanded, yet load-shedding persists. Sanitation and clean water access are improving, but unevenly distributed.

Governance and Institutional Framework:
Union Parishads and local government entities have formal mandates but often operate with limited resources and bureaucratic inefficiencies. Community-Based Organizations (CBOs) and NGO-led platforms have stepped in to fill governance gaps, especially in environmental management, resource-sharing, and resilience planning. Women's involvement in local decision-making is increasing, although structural gender inequalities remain.

Climate Vulnerability:
Laksam is highly exposed to climate-related hazards, particularly flash floods, seasonal waterlogging, and erratic rainfall. These events disrupt agricultural cycles, damage infrastructure, and threaten food and income security. The low-lying floodplain geography, coupled with inadequate drainage and embankment maintenance, heightens the area's sensitivity to climatic shocks. Vulnerable populations, such as landless farmers and marginal fishers, face disproportionate risks during such events.

Cultural Identity and Local Knowledge:
The community maintains a rich cultural heritage, with seasonal fairs, religious festivals, and vernacular knowledge guiding local resource use. Traditional ecological knowledge, especially related to farming cycles and water management, remains vital to adaptive practices.

The Sample Size, Data Collection, and Analysis

Measuring community resilience presents significant challenges, primarily due to the lack of direct empirical data. As a result, it is not feasible to establish a robust regression relationship between community resilience and its underlying dimensions or determinants. To date, there is limited literature that empirically quantifies this relationship. Most existing studies have relied on the construction of composite resilience indices, while others have adopted theoretical or descriptive approaches. Given these constraints, our study adopts a mixed approach, both quantitative and qualitative, to offer a more comprehensive understanding of community resilience.

Due to the absence of a community-scale census in Bangladesh's national statistical framework, we relied on secondary data sourced from the Bangladesh Academy for Rural Development (BARD). This dataset was compiled through a comprehensive door-to-door household survey conducted by BARD in 2025. The dataset comprises responses from 204 households, of which 145 belong to areas covered under the Community Enterprise Aquaculture (CEA) project, while the remaining represent households outside the intervention area.

The total sample of 204 households—145 from the treatment group and 59 from the control group was determined in accordance with the baseline sampling framework developed by the Bangladesh Academy for Rural Development (BARD). Both treatment and control areas have populations of approximately 800 households each. Using the standard sample determination principles outlined by Israel (1992), a sample of 204 ensures sufficient representativeness and statistical reliability at a 95% confidence level with a ±7% margin of error. Following Israel (1992)), the sample size for a finite population can be calculated using the formula:

$$n = \frac{N.Z^2.p.(1-p)}{(N-1).e^2 + Z^2.p.(1-p)}$$

where:

- $n=$ required sample size

- $N=$ population size (800)

- $Z=$ Z-score corresponding to the desired confidence level (1.96 for 95% confidence)

- $p=$ estimated proportion of an attribute in the population (0.5 for maximum variability)

- $e=$ acceptable margin of error (0.07 for ±7% precision)

Applying this formula yields a recommended sample size of approximately 204 households, ensuring representativeness and reliability.

The original survey included an extensive set of 229 questions. From this, we selected 21 questions specifically aligned with key indicators of community resilience. These questions were distributed across seven core resilience dimensions:
Resource Robustness, Social Capital, Economic Development, Information and Communication, Community Competence, Active Agents/Leadership, and Participation/Collective Action.

The refined dataset was structured with 21 columns, capturing targeted variables related to resilience. The selected questions encompassed a range of community resilience aspects, such as access to income opportunities, involvement in collective activities like aquaculture, and perceived improvements in infrastructure, livelihoods, and social cohesion.

After completion of data collection, we proceeded to construct indices for each component to measure overall resilience using the following structured methodology:

Binary Coding of Responses: Each survey response was converted into a binary format, assigning '1' for affirmative/positive responses and '0' for negative/negative responses. This standardization enabled consistent analysis across all households.

Grouping of Questions by Dimension: The 21 questions were grouped under the seven resilience dimensions mentioned above.

Equal Weighting: In the absence of expert consensus for indicator importance, **equal weights** were assigned to each question within its respective category, ensuring methodological neutrality.

Sub-index Construction: For each dimension, a **sub-index score** was calculated at the household level using the formula:

$$\text{Dimension Score} = \frac{\sum \textbf{Binary Responses in Category}}{\textbf{Total Questions in Category}} \tag{1}$$

For instance:

$$\text{Resource Robustness Score} = \frac{\sum \textbf{Binary responses in Resource Robustness}}{\textbf{Number of Questions in Resource Robustness}} \tag{2}$$

Community-Level Aggregation: Household scores for each dimension were aggregated to obtain community-level average scores for each dimension.
Overall Community Resilience Index (CRI): An overall score for each household and community was computed by averaging the 7 dimensions sub-indices:

$$\text{Overall CRI} = \frac{\sum \text{All Dimension Scores}}{7} \tag{3}$$

The final CRI value ranges from 0 (completely non-resilient) to 1 (fully resilient).

Group Comparison: Finally, we constructed separate CRI values for the two groups of project participants and non-participants, to compare the impact of the CEA intervention on community resilience.

This methodological framework allowed us to generate a standardised, interpretable, and comparative measure of community resilience, offering clear insights into the effectiveness of the CEA initiative in enhancing adaptive capacities and local robustness.

To mitigate potential internal biases in the secondary survey data obtained from the Bangladesh Academy for Rural Development (BARD) for the Laksam 2025 study, we adopted a mixed-method triangulation approach. The BARD survey was originally designed to compare socioeconomic conditions between treatment and control areas and to guide capacity-building and community development objectives closely aligned with our research.

First, six Focus Group Discussions (FGDs) were conducted with diverse community members, including project participants, non-member households, women, and local leaders, to validate, challenge, and contextualize patterns in the BARD dataset. These discussions captured local perceptions, lived experiences, and contextual nuances that structured surveys may overlook. Second, Key Informant Interviews (KIIs) were conducted with union parishad representatives, project managers, SHISUK field staff, and local fisheries experts to cross-check institutional, operational, and environmental information reflected in the secondary data. Third, direct field visits to the Laksam area allowed observation of aquaculture practices, seasonal landscape changes, hydrological conditions, and community-enterprise operations, helping to identify inconsistencies and gaps.

By integrating FGDs, KIIs, and field verification, the study minimized measurement errors, respondent biases, and contextual omissions, enhancing the reliability, validity, and analytical credibility of the research, while building upon BARD's original focus on socioeconomic comparison and community capacity development.

Results and Discussion

Key findings

This study compares community resilience indices in the project area and the control area. Table 1 shows clear differences in several aspects of community resilience, including the overall index. These results suggest that the intervention helped strengthen community capacity.

Table 4: Results and Findings for Community Resilience Index

CR	Resource Robustness Index	Social Capital Index	Economic Development Index	Info & Communication Index	Community Competence Index	Active Agents/Leaders Index	Participation/ Collective Action Index	Overall Community Resilience Index
Project Area	0.84	0.70	0.79	0.80	0.80	0.85	0.75	0.79
Outside Project Area	0.50	0.45	0.44	0.50	0.47	0.35	.55	0.47

Discussion

The results presented in the above highlight a significant disparity in community resilience between the project and non-project areas, reflecting the transformative impact of the Community-Based Enterprise (CBE) model implemented under SHISUK's guidance. The overall Community Resilience Index (CRI) in the project area stands at 0.79, markedly higher than the 0.47 recorded in the non-project area difference of 0.32. This notable gap illustrates

how integrated, community-driven approaches can nurture a range of adaptive capacities, collectively enhancing resilience in vulnerable rural settings.

This discussion uses the theory of community resilience, which sees resilience as a set of connected abilities like strong resources, social ties, economic growth, communication, community skills, leadership, and working together. It examines how each of these areas affects the results we see.

Resource Robustness

With a Resource Robustness Index of 0.84 in the project area, compared to 0.50 outside it, the data indicate that sustainable resource management plays a central role in building resilience. In the project area, the seasonal, collective use of floodplains through aquaculture enhances both ecological stability and resource equity. This approach echoes (Ostrom 1990) principles of collective governance for common-pool resources, emphasizing clear boundaries, participatory rule-making, and sustainable use. The result is a more robust resource base that supports long-term livelihoods and buffers environmental shocks.

Social Capital

The Social Capital Index is significantly higher in the project area (0.70) than in the non-project area (0.45), reflecting the importance of trust, social cohesion, and networked cooperation in shaping resilience. Within the CBE model, mechanisms such as collective ownership, shared decision-making, and institutional transparency help foster mutual accountability and solidarity. These practices align with the literature that identifies social capital as a critical enabler of collective action and adaptive capacity (Buikstra et al., 2010; Aldrich, 2012).

Economic Development

Economic resilience is also clearly evident, with an Economic Development Index of 0.79 in the project area versus 0.44 in the non-project area. The dual-use of land—for agriculture in the dry season and aquaculture during the wet season has diversified income streams and strengthened household economic security. Such diversification reduces vulnerability to single-source shocks like crop failure and fosters inclusive local growth, as emphasized in Faiaz (2020).

Information and Communication

Information and communication systems are stronger in the project area (0.80) compared to the control (0.50). This reflects the community's improved access to knowledge-sharing platforms, risk communication, and early warning mechanisms, facilitated by SHISUK through regular meetings, training, and peer-to-peer learning. Efficient information flow enhances both preparedness and responsiveness, echoing findings from Norris et al. (2008) that emphasize the importance of trusted communication networks in resilience systems.

Community Competence

The project area also demonstrates a higher level of community competence (0.80) compared to the control (0.47), suggesting greater problem-solving ability, adaptive learning, and collective decision-making. SHISUK's facilitation of participatory planning processes and conflict resolution platforms has enabled the community to better address challenges and adjust behaviors proactively. This finding supports the view that competence is both a technical and psychological dimension of resilience, involving not only capacity but also confidence in that capacity (Magis, 2010).

Leadership and Active Agents

The Leadership Index shows a striking gap: 0.85 in the project area versus 0.35 outside. This suggests that local leadership structures, often fostered and trained by SHISUK, are central to effective coordination, innovation, and crisis response. These leaders serve as catalysts for resilience by mobilizing resources, coordinating actions, and bridging between community members and external institutions (Buikstra et al., 2010; Bayazid et al., n.d.).

Participation and Collective Action

Interestingly, the Participation and Collective Action Index is slightly higher in the control area (0.55) than in the project area (0.75). While this may seem counterintuitive, it likely reflects informal, reactive participation in the absence of structured institutions. In contrast, the project area's participation is organized, inclusive, and often mediated through institutional platforms, emphasizing depth, accountability, and strategic engagement over mere frequency (Kulig et al., 2013).

Synthesis: CEA as a Resilience-Enabling Model

The comparative results strongly support the theoretical and empirical linkage between the CEA model and community resilience. As conceptualized, resilience is not a static trait but a dynamic process enabled by interconnected adaptive capacities (Gunderson, 2000; Longstaff et al., 2010). The CEA model inherently promotes these capacities through its principles of participatory governance, resource co-management, economic diversification, and social cohesion.

By fulfilling key resilience criteria such as robust resource management, distributed leadership, effective communication, and institutional trust, the project area demonstrates a holistic resilience framework in practice. The empirical differences observed across dimensions affirm that CEA does not merely address economic needs but systematically strengthens the community's structural, social, and institutional capacity to withstand and adapt to shocks.

Limitations

Despite the strengths of this study, we acknowledge several key limitations that constrained the depth and precision of our analysis. First and foremost, we faced the critical challenge of the absence of a universally accepted or empirically grounded model for systematically measuring and evaluating community resilience. The multifaceted and context-specific nature of resilience makes it inherently difficult to capture through a single framework. Consequently, we were compelled to rely predominantly on secondary data sources, which, while useful, often lack the granularity and contextual depth required to assess localized resilience dynamics comprehensively.

Furthermore, the process of constructing a composite index poses significant methodological difficulties. Specifically, assigning appropriate weights to each dimension and underlying factor proved complex and contentious. A more robust and credible weighting approach ideally demands consensus-driven input from a multidisciplinary panel of experts, combining domain knowledge from environmental science, sociology, economics, and disaster management. Unfortunately, due to constraints in resources, time, and institutional access, convening such a panel was beyond the practical scope of our study. As a result, the index developed in this research, while methodologically reasoned, may still reflect certain limitations in its ability to fully capture the relative importance and interplay of resilience dimensions in diverse community contexts.

Recommendations

There is a need for more in-depth and comprehensive studies on community resilience to better understand how communities can adapt and thrive amidst various challenges. Special attention should be given to the management of common-pool resources (CPR), with active support and engagement from the government to ensure these resources are sustainably and fairly governed. It is equally important to identify and showcase successful CPR management models, so they can inspire and guide other communities. With the right support, these proven models can be replicated and adapted in different regions, helping to build stronger, more resilient, and sustainable communities across the country.

Conclusion

This study demonstrates that community-based enterprise models, such as the Community-based Enterprise Approach (CEA), can enhance community resilience to ongoing environmental and social challenges, as observed in Bangladesh. By fostering collaboration, resource-sharing, and the application of local knowledge, the CEA model promotes sustainable resource use while strengthening social cohesion, leadership, and adaptive capacity. Higher resilience scores in CEA communities highlight the positive effects of grassroots collaboration and participatory decision-making. Anchored in Ostrom's principles and adaptive capacity theory, this approach links sustainable resource management directly to community resilience. The success of the CEA model offers practical lessons and a replicable example for other communities seeking to strengthen both social and ecological sustainability.

Although the analysis primarily relied on secondary survey data collected by BARD in the Laksam area for 2025, multiple steps were taken to mitigate internal biases and ensure analytical rigor. Recognizing potential limitations in secondary datasets—such as respondent errors, sampling inconsistencies, and gaps in contextual information—we triangulated the BARD data with qualitative evidence from six Focus Group Discussions (FGDs), multiple Key Informant Interviews (KIIs), and direct field observations.

This triangulated approach enabled verification of key patterns, clarification of anomalies, and grounded interpretation of community behaviors, institutional arrangements, and ecological dynamics. By reducing measurement bias and improving contextual accuracy, it enhanced the reliability and credibility of the findings. The study concludes that collective ownership, robust social capital, transparent benefit-sharing, institutional accountability, and adaptive

resource management underpin the resilience of CEA systems. These insights provide valuable guidance for scaling community-based enterprises and fostering climate-resilient livelihoods across Bangladesh.

Acknowledgement

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Appendix:

Survey Questions Selected for This Study, Categorized According to Key Dimensions of Community Resilience

Dimension	Questions
1. Resource Robustness	• Do you think your community has enough natural and material resources? • Have you seen any infrastructure improvements (e.g. roads, embankments, etc.) in your area over the last 2–3 years? • Have production or consumption levels increased in your area for paddy, fisheries, or poultry? • Have you noticed any improvements in resource quality over the past 2–3 years in your

	region? • Do you feel your community has sufficient income-generating opportunities?
2. Social Capital	• Do you think there are places for the community to gather and discuss common agendas (e.g. clubs, community centers)? • Do you feel that people in your community generally trust one another? • Do you see any collective initiatives or mechanisms that bring people together for shared ownership and decision-making? • Do you believe community members respect diverse viewpoints and opinions?
3. Economic Development / Stability	• Do you think financial services and access to capital for entrepreneurship are available in your community? • Do you feel the sources of income for people in your community have increased? • Has the value of land or rent prices increased? • Do you see diverse and new employment opportunities in your area? • Have you noticed increased business activities and entrepreneurial ventures?
4. Information and Communication	• Do you feel that communication channels (e.g. roads, transport, mobile networks) in your community have improved? • Are there physical venues where people regularly come together to exchange information and ideas? • Do you believe government agencies and services have improved their reach and responsiveness to your community in the past 2–3 years?
5. Community Competence	• Do you think your community's adaptation capacity to shocks (e.g. flood handling through technology or group initiatives) has increased? • Do you believe community members have been receiving different trainings and skill-building programs recently? • Have you noticed greater accessibility to support from NGOs or government bodies in your community in recent times?
6. Active Agents / Leaders	• Have you observed an increase in the number of active leaders in your community? • Do you feel there are opportunities for practicing leadership within your community? • Have you noticed an increase in engagement and interventions by NGOs or government organizations in your area recently?
7. Participation / Collective Action	• Are you involved in any collective action or group initiative within your community? • Does your community practice shared ownership or management of any communal assets? • Do you feel everyone in the community is given an equal opportunity to participate in collective action?