Chapter 2
A Framework for Climate Resilient Community-Based Adaptation

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Key Messages

- Community-based approaches create innovative opportunities for building climate resilience.
- Local initiatives can also address other preexisting socioeconomic issues that are part of the UN Sustainable Development Goals.
- An integrated approach can foster the development of locally relevant, culturally appropriate, and resource-efficient solutions.

2.1 Introduction

> Saving our planet, lifting people out of poverty, advancing economic growth… these are one and the same fight. We must connect the dots between climate change, water scarcity, energy shortages, global health, food security, and women's empowerment. Solutions to one problem must be solutions for all. Ban Ki-moon (United Nations, 2011).

Climate change is the defining environmental challenge of the twenty-first century—posing a global threat to the sustainability of environmental, social, and economic systems spanning from the North Pole to the South and all areas in between.

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Despite the urgency, progress in forging international climate change agreements and implementing effective mitigation programs has been slow. Political shifts in the United States and elsewhere have stalled comprehensive and coordinated efforts needed to implement the far-reaching, multilevel, and cross-sectoral mitigation and adaptation that the Intergovernmental Panel on Climate Change (IPCC) determined would be needed to deal with the projected impacts of climate change (Costanza, 2017; Yeo, 2019). In addition, the COVID-19 pandemic and its impact on the global economy further threaten timely disbursement of climate finances outlined in the 2015 Paris Agreement (UNFCCC, 2015). The latter particularly affects the implementation of top-down adaptation programs in developing countries that rely on large infrastructure investments.

The coastal communities in South Asia and other developing countries are particularly vulnerable to climate impacts due to their geographic location, demographics, and associated development challenges. The IPCC emphasizes that far-reaching, multilevel, and cross-sectoral climate mitigation needs to be upscaled and accelerated; both incremental and transformational adaptation strategies would be required to effectively address future climate-related impacts (IPCC, 2018).

Community-based initiatives are emerging as promising approaches to lessen the impacts of climate change while empowering people and bolstering community resilience (Kirkby, Williams, & Huq, 2017). These approaches have been applied to a wide range of climate adaptation programs in climate vulnerable communities—from disaster risk reduction (DRR), emergency preparedness, and flood/drought protection to sustainable agriculture, water resource management, food security, and resilient livelihood solutions (Shammin, Wang, & Sosland, 2021, Chap. 3 of this volume; UNDP, n.d.). Local innovation and agency are critical complements of these programs in fostering sustained community resilience. Therefore, community-based approaches with direct engagement of the vulnerable population that are adequately supported by international agencies, national and local government, academics, experts, and nonprofit organizations have the potential to develop locally relevant, culturally appropriate, and sustainable solutions (IPCC, 2014a).

Sustainable Development Goals (SDGs) and the principles of resilience offer additional tools to situate current climate adaptation initiatives and explore opportunities for enhancing existing adaptation models. There is documented evidence of successful outcomes of community-based initiatives in improving both the adaptive capacity and resilience. There is a need to learn from these initiatives to develop a more integrative and standardized framework that can be widely replicated (McNamara & Buggy, 2017).

This chapter adopts a holistic approach to designing future community-based adaptation programs that builds on past approaches while maximizing opportunities presented by recent developments in SDGs, resilience principles, and disaster risk reduction (DRR) initiatives. First, we deconstruct the landscape of climate change response and define key concepts and terms. Next, we contextualize the broader concepts of sustainability, sustainable development, and resilience. This is followed by a discussion on the opportunities and challenges of community-based adaptation to climate change. Finally, we present an integrative framework based on emerging concepts and lessons learned.

2.2 Key Concepts and Definitions

Climate change poses significant threats to both the abiotic (physical) and biotic (living) parts of the environment as well as economic growth and social well-being—especially in less developed countries. A report from the Asian Development Bank (ADB) predicts that by 2050, the collective economy of six South Asian countries—Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka—will lose, on average 1.8% of its annual gross domestic product due to climate change impacts, rising to 8.8% by 2100 (ADB, 2014).

Climate change can also push millions of people to migrate when they reach the limits to adaptation, further intensifying intrastate and interstate competition for food, water, resources, and livelihood opportunities. There is documented evidence that climate change and weather variability are negatively impacting crop yields in Bangladesh, India, and Pakistan leading to an increase in the number of people migrating from the countryside into cities (Lohano, Iqbal, & Viswanathan, 2016). Mass migration of climate-displaced populations can have a "spillover" effect across national borders leading to heightened geopolitical tension and other global security concerns (Podesta, 2019). Against this backdrop, achieving the goals of the Paris Agreement by keeping the global average temperature rise in this century below 2 degrees Celsius over pre-industrial levels will require global collaboration and response on two fronts: *mitigation* and *adaptation* (UNFCCC, 2015).

IPCC defines mitigation of climate change as "A human intervention to reduce the sources or enhance the sinks of greenhouse gases" (IPCC, 2014c). This involves reducing the burning of fossil fuel by switching to cleaner renewable energy sources and enhancing carbon sinks via sustainable forest/land-use management practices.

Adaptation is defined by IPCC as "The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects" (IPCC, 2014c). Enhancing the adaptive capacity of a community will improve its ability to plan, respond to, and recover from external shocks, thereby making it more resilient.

2.3 The Impact Response Pathway

The process by which climate change impacts get translated into concrete societal response is complex and multifaceted. Figure 2.1 presents an overview of this process, where the societal response to the biophysical impacts of climate change is collectively determined by a range of mediating factors identified as "actors" and "enablers." The lists of mediating factors included in Fig. 2.1 are not exhaustive, but each of them play an important role in determining their collective ability to anticipate, prepare for, and respond to the present and future threats of climate change.

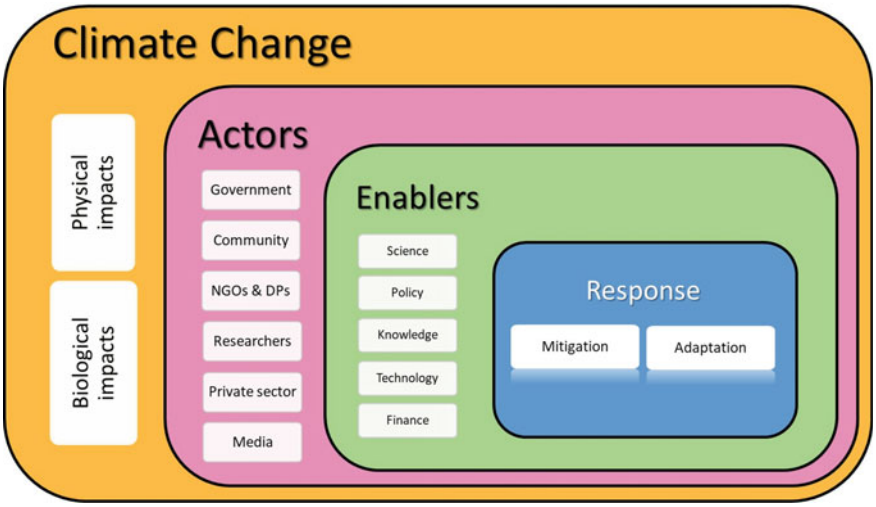

Fig. 2.1 Anatomy of climate change response. *Source* Author's conceptualization

2.3.1 Climate Change Actors

Both state and non-state actors play a dual role in determining the nature of response to climate change. On the one hand, they experience the biophysical impacts as institutions and individuals. On the other hand, they are also the drivers of change. These actors interact with each other within the given socioeconomic and political contexts, identify and prioritize key concerns, develop strategies, collaborate with internal and external stakeholders, mobilize resources, and ultimately design and implement the climate response programs. Coordination among the various levels of government, community-based organizations, domestic and international NGOs, international development partners (DPs), researchers (including academics), media, and the private sector is critical for achieving better outcomes.

Systemic issues can also hinder progress. For example, governments tend to suffer from "institutional inertia" and they are generally reluctant to antagonize influential private or communal interests who benefit from maintaining the status quo. As noted by Meadowcroft (2010), "Conflicts of power and interest are inevitable in relation to climate change policy" and "Climate change governance requires governments to take an active role in bringing about shifts in interest perceptions so that stable societal majorities in favour of deploying an active mitigation and adaptation policy regime can be maintained." This implies that groups aiming to bring about systemic change must focus on "building coalitions for change" at every level of decision making and "establishing new centers of economic power" so that systemic weaknesses can be reversed.

Similarly, multilateral and bilateral development partners play a delicate role in mediating climate change policies and actions. On the one hand, their stated mission

is to align their programming with the priorities of national governments they partner with. On the other hand, they are accountable to their trustees and/or taxpayers in ensuring value for money from development aids, which is often clouded by other foreign policy agenda.

2.3.2 Climate Change Enablers

This complex and often contentious negotiation around social response is further mediated by the enabling factors. As depicted in Fig. 2.1, these factors influence the quality of response when the actors finally agree on the threat and are willing to take action. To begin with, climate science provides information on the cause and extent of climate change. This helps to generate future scenarios that inform evidence-based policy development including sector-specific goals for climate response.

It is important that climate policy is closely aligned, and preferably well integrated, with other key sectoral policies related to energy, infrastructure, industry, agriculture, natural resources, health, and the environment. One area where this policy alignment is crucial is disaster risk reduction. The Hyogo Framework for Action specifically identifies the need to "promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change" (UNISDR, 2005). Similar sentiment is echoed in the Sendai Framework, where one of the guiding principles is that "The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and variability, environmental management and disaster risk reduction agendas" (UNDRR, 2015).

The integration of indigenous knowledge in policy formulation offers opportunities for developing community-based adaptation initiatives that are socially and culturally compatible, and consistent with the long-term sustainability requirements of the climate vulnerable communities. According to the IPCC Fifth Assessment Report, indigenous peoples' holistic view of community and the environment is a major resource for adapting to climate change (IPCC, 2014a).

Technological innovation is essential in climate proofing national and community-level infrastructure (e.g., roads, bridges, embankments, and cyclone shelters), protecting natural resources (e.g., forests fisheries), and creating new livelihoods options (e.g., by introducing salt-tolerant crops in coastal areas). It is important that various climate actors adopt an evidence-based and collaborative approach in developing and implementing technological solutions to achieve mitigation and adaptation goals.

Climate finance is another crucial enabler as access to adequate funding is essential for supporting adaptation initiatives in less developed countries. The polluter pays principle is now well established, and the 2015 Paris Agreement includes provisions for developed countries to mobilize financial support to assist developing country

parties with climate change mitigation and adaptation efforts. It affirms a collective pledge by developed countries of providing $100 billion annually by 2020 and calls for continuing this collective mobilization through 2025 (Lattanzio, 2017)—the actual disbursement of which is complicated by political shifts in the USA and the COVID-19 pandemic, as mentioned earlier.

2.3.3 Adaptation Gap

"Adaption Gap" is the difference between the actual level of adaptation and the level required to achieve a societal goal, reflecting resource limitations and conflicting priorities (UNEP, 2014). Unfortunately, estimating the adaptation gap is far more challenging than estimating the emission gap, simply because there is no globally agreed goal or metrics for adaptation. Furthermore, adaptation is a response to specific climatic threats that may vary widely over geographic locations and time.

According to UNEP (2014), there will likely be a significant adaptation funding gap after 2020, which has been estimated to be in the order of US$70 billion to US$100 billion per year. Given the size of this deficit, multilateral and bilateral grants, domestic public finance, and contributions from the private sector—all are expected to play a role in closing this gap. In reality, a major gap in adaptation finance still persists. According to UNEP (2018), the global public finance flows in support of adaptation reached only about US$23 billion in 2016. Approximately 64 percent of this went to less developed countries via bilateral climate finance, multilateral climate funds, and multilateral development banks.

2.3.4 Limits to Adaptation

Adaptation limits are closely related to the notion of adaptation gap. A limit to adaptation is reached when adaptation efforts are unable to provide an acceptable level of security from risks to the existing objectives and values (IPCC, 2014d). Scaling down global GHG emissions and enhancing adaptive capacity may not, in the end, guarantee the desired level of risk reduction. This is because social and institutional actors are often constrained by opportunities, resources, and time needed to successfully implement and/or scale up adaptation efforts.

Dow et al. (2013) proposed a risk-based definition of adaptation limits, where adaptation efforts are considered as incremental efforts to keep the risk of adverse impacts within tolerable limits. For a given frequency and intensity of an adverse impact, the threshold for intolerable risks represents a point at which an actor must either live with the risk of escalating loss and damage, or drastically change behavior to avoid the risk, say by adopting transformational measures including relocation. According to the authors, "such a discontinuity in risk or behavior is symptomatic of an adaptation limit being reached."

2.3.5 Loss and Damage

The phrase *loss and damage* is used in the context of residual impacts that society is bound to experience beyond what can be avoided through adaptation. In addition, "loss refers to things that are lost forever and cannot be brought back, such as human lives or species loss, while damages refer to things that are damaged, but can be repaired or restored, such as roads or embankments" (Pidcock & Yeo, 2017). With the inclusion of Article 8 of the Paris Agreement, loss and damage is now a thematic pillar under the United Nations Framework Convention on Climate Change.

2.3.6 Sustainable Development Goals

IPCC defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (IPCC, 2014c). This definition was originally introduced by the World Commission on Environment and Development (WCED, 1987). Werners et al. (2013) argue that climate change shifts the sustainability challenge from conservation to adaptation. The authors contend that thresholds, and tipping and turning points are important focal points for sustainability under climate change that help bridge the gap between science and policy. Essentially, climate change has forced us to embrace the notion of a system that is likely changing at an accelerating pace. The scale of the issue has changed as well from local to global, which was not always the case previously. A new discipline, sustainability science, evolved using interdisciplinary research involving scientists and social actors to produce knowledge that supports and informs solutions, transformations, and transitions toward sustainability (Caniglia et al., 2017).

While these developments provide further conceptual clarity on sustainability and sustainable development, application of these concepts as guidelines and toolkits needed more detailed and comprehensive metrics. The initial work toward implementation of sustainable development began at the Earth Summit in 1992 through the preparation of Agenda 21—the Rio Declaration on Environment and Development. This was followed by the Millennium Development Goals at the turn of the century and further refined in the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. The agenda provides a shared blueprint for peace and prosperity for people and the planet. The SDGs recognize that addressing poverty alleviation and other development challenges must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth while tackling climate change and safeguarding the environment (United Nations, n.d.).

The SDGs shown in Fig. 2.2 build on more than two decades of global endeavors to operationalize sustainable development. These goals provide a detailed, practical,

Fig. 2.2 Sustainable development goals *Source* United Nations (n.d.)

and comprehensive deconstruction of the concepts of sustainability and sustainable development that captures the spirits of economic advancements, environmental responsibility, and social justice. The goals are supplemented by additional resources for implementation in a wide variety of contexts. According to an IPCC special report published in 2018, these Sustainable Development Goals provide a new framework to consider climate action within the multiple dimensions of sustainability (IPCC, 2018). The Government of Bangladesh, for example, has included SDGs in the 2016–20 National Plan for Disaster Management (Shammin, Firoz, & Hasan, 2021, Chap. 16 of this volume).

2.3.7 Resilience Principles

Ecologists have long used the concept of resilience for investigating why some ecological systems survive while others fail when faced with disturbance. It draws from the basic principles of physics of a spring that expands when pulled and retracts when released. It is the property of a system to bounce back or re-establish stability after being disturbed or perturbed. IPCC defines resilience more broadly as the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (IPCC, 2014c).

Elmqvist et al. (2019) argue that the concept of resilience goes far beyond the mere recovery from disturbances and builds on the adaptive and transformative capacities of subsystems across time and scales. Tanner et al. (2014) introduced the concept of livelihood resilience as the capacity of all people across generations

to sustain and improve their livelihood opportunities and well-being despite environmental, economic, social, and political disturbances. Such resilience is underpinned by human agency and empowerment, by individual and collective action, and by human rights, set within dynamic processes of social transformation. For example, Jordan (2015) analyzed case studies of specific communities in the southwest coastal region of Bangladesh and found a complex relationship between social capital and enhancing resilience to climate stress. Amin and Shammin (2021, Chap. 5 of this volume) detail the experience of the application of a resilience analysis protocol to facilitate community-led initiatives on livelihood and nature-based solutions to climate adaptation.

Elmqvist et al. (2019) also point out that resilience to climate change could mean social resilience or community resilience, or technological infrastructure resilience or ecological resilience if applied through a framing where social, ecological, and technological subsystems may differ in ways that challenge any kind of general system-level resilience. For example, United Nations Office for Disaster Risk Reduction (UNISDR) specifically defines resilience as: "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions" (UNISDR, 2009). In terms of development and climate change adaptation, the concept of resilience provides one of the most promising approaches to poverty reduction, development, growth, and sustainability (Ayeb-Karlsson et al., 2015).

Stockholm Resilience Centre has developed seven principles of resilience building that are designed to guide program development and implementation (Stockholm Resilience Centre, 2020).

1. Maintain Diversity and Redundancy.
2. Manage Connectivity.
3. Manage Slow Variables and Feedback.
4. Foster Complex Adaptive System Thinking.
5. Encourage Learning.
6. Broaden Participation.
7. Promote Polycentric Governance.

The Paris Agreement emphasizes the importance of fostering resilience as a key goal for addressing both adaptation, and loss and damage. The Sustainable Development Goals (SDGs) are closely linked to resilience building. The Global Climate Risk Index 2019 report concluded that carefully, locally, and inclusively designed adaptation measures can contribute to achieving the SDGs and increasing the resilience of communities (Eckstein et al. 2019). The Sendai Framework on Disaster Risk Reduction includes understanding of disaster risks, strengthening disaster management governance, investing in risk reduction, and resilience building. The SDGs and resilience principles thus offer opportunities for integrative community-based climate change adaptation programs at the grassroots level.

2.4 Community-Based Climate Adaptation

The word "community," as defined by the German Sociologist Ferdinand Tönnies, is meant to represent "a cohesive social entity" bound by a "unity of will" (New World Encyclopaedia, 2020). In this sense, a community-based adaptation activity could be led by an NGO, a cooperative, a closely bonded ethnic group, a village or even a "society" formed under a law with a specific set of objectives in mind. A community-based adaptation (CBA) program is closely associated with rural and other vulnerable people striving to improve their livelihood against the imminent and long-term threat of climate change. IPCC recognized that community-based adaptation activities for climate change in developing countries reveal a range of lessons as well as their limits (IPCC, 2014b). See Shammin, Wang, & Sosland (2021, Chap. 3 of this volume) for more on the concept, evolution, barriers, and opportunities of CBA.

Historically, richer nations have been able to adapt to the impact of climate change by making significant public investments in projects such as river training, embankments, and barrages. However, in many developing countries where government machinery is weak or even nonexistent, it is the communities that have protected life, used collective knowledge, and supported the weakest members against the wrath of nature. In fact, communities in Asia are often seen as a substitute for governments in terms of building strategies to navigate through difficult times. It is in this context that CBA plays a special role in reducing impacts of climate change in a community.

Community-led interventions can differ widely. Some interventions are indigenous in nature-built with the knowledge and strength within the community and its resources, while others require help from outside in terms of knowledge and/or resources to address the risks beyond the capacity of the community. Another variety of CBA that exists today has evolved over time through support from international partners and donors—who lent support to the vulnerable communities to build their ability to face the climate-induced disasters. In developing countries, adaptation constraints result from lack of access to credit, land, water, technology, markets, information, and perceptions of the need to change (IPCC, 2014b). However, several recent examples demonstrate that CBA initiatives can be developed at a low cost using domestic resources and existing international support (Shammin, Firoz, & Hasan, 2021, Chap. 16 of this volume).

After examining various adaptation strategies promoted as CBA activities, we classified them into six broad categories as shown in Fig. 2.3 and explained below.

2.4.1 Livelihood Diversification

Many of the livelihood activities are based on seasonality and other long-term climatic conditions. Climate change alters this status quo that supports the livelihood of millions of people. IPCC AR5 (2014b) reports clearly stated that due to climate change tropical agriculture will lose yield. This will have significant impact on the

lives and livelihood of people across the world and particularly on people living in tropical zones (IPCC, 2014a). For example, farmers in Bangladesh are used to planting rice in July and harvest the crop in November. This has been the case for centuries resulting in the crop calendar being designed to emulate this pattern. Similar patterns exist in many other countries. However, if due to climate change, rainfall patterns change either nationwide or in the catchment areas of the rivers which flow into Bangladesh, the timing of riverine floods will shift. As a result, it may no longer be feasible for farmers to plant rice crops in July. As such, they may lose a seasonal crop and any associated income. Unless they are prepared to deal with untimely flooding with alternative strategies (like transplanting the crops in September), they might find it difficult to maintain their livelihood. Alternatively, they may switch to a rice variety which can withstand temporary flooding. For example, farmers in Bhutan used their traditional knowledge to use four indigenous breeds of rice to sustain their livelihoods. In many cases, CBA interventions supported vulnerable communities to diversify their sources of income so that if a crop is partly damaged due to climate variability, they can still manage to support their families.

2.4.2 Capacity Building

Vulnerable communities are often located in remote areas and do not have access to modern technology and knowledge base. These communities not only have low access to many public facilities but often do not have access to programs supporting formal or informal education and training. Many community-based adaptation programs, therefore, seek to leverage support from institutions, agencies, and donors. These programs introduce new technologies and products through building

Fig. 2.3 Classification of CBA activities. *Source Author's conceptualization*[1]

[1] Some graphic elements in this figure have been obtained from free templates at www.presentationgo.com.

community-based awareness and/or sensitization programs. Rainwater harvesting in Nepal, desalination of water in coastal areas of Bangladesh, and introducing "floating agriculture" on a water hyacinth-made bed in water-logged areas are examples of such endeavors.

2.4.3 Ecosystem Integrity

Climate change is nature's response to human abuse on its integrity through excessive greenhouse gas emissions into the atmosphere. As such, we see nature's wrath on vulnerable communities in the Tarai lands of Nepal, on the coastal areas of Tamil Nadu, Odisha, and Bengal in India, and in coastal and riparian areas in Bangladesh, Pakistan, and so on. In many instances, communities work together with or without supports to restore the integrity of nature. Such endeavors include reforestation of degraded forest land, restoring tidal flooding of coastal rivers, protection of riverbanks, and building natural erosion control bunds. These actions eventually give the vulnerable communities a strategy to restore nature's ability to deal with extreme weather conditions like erosion, floods, water-logging, and similar events.

2.4.4 Infrastructure

Climate vulnerable communities in South Asia use local and indigenous techniques to build physical infrastructure to prevent flooding, reduce intrusion of saline water into the crop fields, control erosions, etc. For example, communities in Nepal have devised strategies to store rainwater for irrigation while communities in Bangladesh used bamboo-based structures to prevent riverbank erosions. Multi-purpose cyclone shelter in Bangladesh is another successful example of adaptation infrastructure in coastal communities.

2.4.5 Microfinance and Insurance

Microfinance has been a popular strategy in many South Asian nations used to liberate unbanked communities from the clutches of informal and often local moneylenders. These institutions give access to loans in local communities to groups of 5 to 20 members to help diversify their income sources. These loans often incorporate capacity building goals, whereby local communities develop the ability to understand the impact of climate change and find strategies to remove such risks. Many microfinance institutions in Bangladesh use microinsurance programs to ensure that borrowers are protected against different risks including flood, diseases, and so on. In addition, many loan packages come with provisions for microinsurance programs

that protect them against climate-related risks. Besides registered NGOs[2] involved in lending, there are many other organizations like forest users' groups, fisheries' cooperatives, and farmers' organizations who are also engaged in lending to their members and supporting communities in dealing with climate risks.

2.4.6 Resource Management

While many community-based organizations are working on restoring degraded ecosystems, some community-based actions include protection of lakes, rivers, and forests in order to ensure that these natural resources provide natural insurance against climate risks. Similarly, in coastal lands, ensuring conservation of mangroves supports coastal communities and provides protection against cyclones and coastal flooding. Farming communities in the Western Ghats of Tamil Nadu and Kerala have restored their forest lands to improve groundwater recharge and ensure that enough water is available in their storage tanks for irrigation.

2.5 CBA Framework for Resilient Communities

Analysis of the successes and failures of CBA initiatives indicate the need to re-conceptualize the process and scope of CBA (Kirkby et al., 2016; Reed et al., 2015; Wright et al., 2014). Programs that build on indigenous knowledge and local resources where community members are active participants in both program development and implementation have the potential for advancing despite the global uncertainties mentioned earlier. Academic literature has emphasized that building adaptation processes from the bottom-up would enhance the adaptive capacity of communities (McNamara & Buggy, 2017). It is important to develop flexible models where programs may be initiated by the community, an external government, or a non-governmental agency. The process would include participatory solutions and iterative learning at the local level complemented by transformative action at national, regional, and international scales. The scope would consider the impacts of climate change alongside poverty, ecological integrity, gender equality, and other development priorities.

CBA programs designed with the explicit purposes of climate adaptation, SDG attainment, and disaster risk reduction can create opportunities for optimizing operational efficiencies and maximizing program outcomes by pooling financial, institutional, and human resources (Eckstein et al. 2019; Ayers & Forsyth, 2009; Ensor & Berger, 2009). Additionally, resilience principles can be integrated in the process

[2] NGOs are often registered with governments to receive donations from home and abroad in support of their activities, whereas there are other organizations which are financed through memberships and are engaged in money lending.

of program development to develop systems that increase community resilience. We present a framework that integrates all these considerations into the life cycle of climate adaptation programs with three primary goals:

- **Maximize outcome** (climate adaptation, community development, and community resilience): Reduce vulnerability and exposure for disaster risk reduction while increasing co-benefits in terms of maximizing SDG attainment and resilience building.
- **Maximize efficiency** (financial, resource, logistics): Enhance coordination to avoid duplication of efforts, reduce reporting burden, improve financial oversight, and enhance cost-effectiveness of measures that contribute to multiple agendas.
- **Maximize equity** (equity and justice): Empower socially and economically marginalized groups by ensuring their active participation in the design and implementation of CBA initiatives.

The framework consists of three levels: resources and strategies that situate CBA programs within the *context* of community knowledge, development needs and adaptive capacities; factors that need to be considered during the *process* of developing CBA programs; and enhancements that would lead to the desired *outcome* of a climate resilient community. The schematics of the CBA Framework is shown in Fig. 2.4 and explained below.

2.5.1 Context

CBA programs include enabling factors that can offer a better understanding of local impacts and potential solutions.

- Knowledge integration: Develop solutions by taking a holistic perspective informed by indigenous knowledge, scientific information, and global experiences (McNamara & Buggy, 2017). Maximize the use of local materials and resources and combine valuable information distilled from the community with transferable lessons from other relevant case studies to design projects.
- Livelihood solutions: Seek solutions that enhance sustainable livelihood opportunities. Adaptive strategies such as modifying agricultural practices or switching to alternative livelihoods that are designed to strengthen people's livelihood resilience (Ayeb-Karlsson et al., 2015).
- Dynamic governance: Establish a system of community-level governance with clear mandates and supporting rules to foster ownership, agency, and self-organization. Build on the existing social capital of the community and optimize connectivity across multiple programs (Stott & Huq, 2014).

2.5.2 *Process*

The process of developing CBA programs includes building blocks that embody the principles of resilience and lessons learned from case studies of CBA applications in developing countries. These can be applied toward the development of a wide range of CBA solutions across contexts and vulnerabilities.

- *Root cause analysis*: Identify and address specific properties of communities, social or environmental, that contribute to or exacerbate their climate risks. For example, if women are disproportionately impacted, then their participation and empowerment should be integrated in the solutions.
- *Capacity building*: Foster capacity building at the local levels to ensure independence, sustainability, and resilience. Integrate training programs for local implementation teams including staff from government and non-government organizations and volunteers. Everyone should be trained on relevant technical information, action steps, and workflow. Communication modes, methods, and chains should be clear and well understood by all.

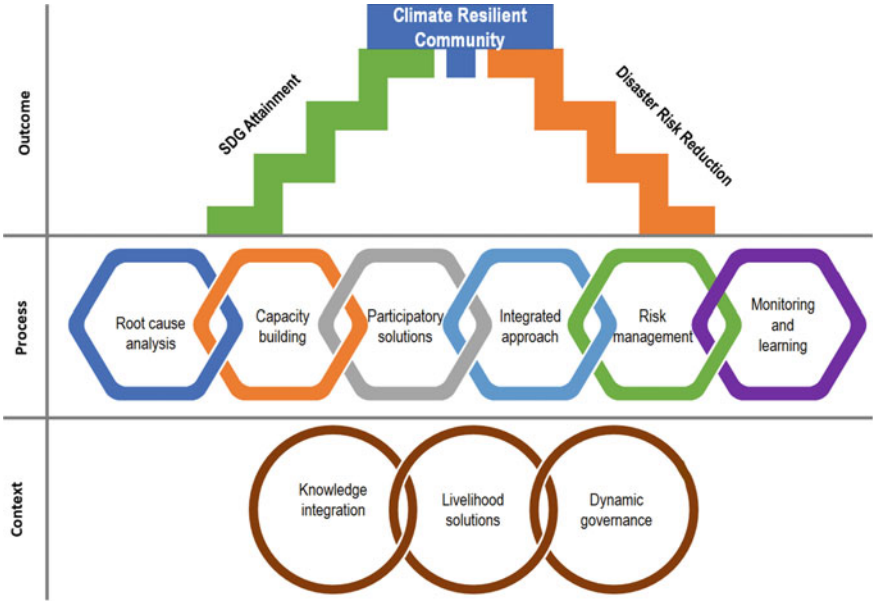

Fig. 2.4 CBA framework for climate adaptation and community resilience. *Source* Authors' conceptualization[3]

[3] Some graphic elements in this figure have been obtained from free templates at www.presentationgo.com.

- *Participatory solutions*: Develop community-based initiatives with representation of key community stakeholders including vulnerable and underrepresented groups over the life cycle of the programs. Prioritize community-led solutions. Establish and maintain trust and local authority.
- *Integrated approach*: Develop multiple interventions using a diverse set of solutions with built-in redundancies instead of large infrastructure solutions that rely on singular solutions.
- *Risk management*: Ensure that risk perceptions are aligned and mutually understood between outside actors and community members. Protect the long-term integrity or stability of the local environment with careful attention to socioeconomic and ecological systems. Both slow and fast variables are considered.
- *Monitoring and learning*: Implement monitoring, feedback, and learning systems to navigate through the complexity of adaptation actions across scales and contexts (IPCC, 2014b).

2.5.3 Outcome

CBA programs are designed to reduce vulnerability and exposure to risks posed by climate change. The elements included under process and context in the CBA framework presented above can help attain a certain level of community resilience and climate adaptation. Well-designed CBA programs constitute the foundations for achieving both sustainable development and climate resilience in communities. They can narrow the gap between adaptation programs and developmental goals. Progress can be made on two parallel fronts to pursue the ultimate goal of developing climate resilient communities.

- *SDG Attainment*: While the steps outlined under process and context may help accomplish advancements toward some closely related SDGs, they are not comprehensive enough to fully harness the potential co-benefits of adaptation programs toward the attainment of all possible SDGs. The aspirational goal of community resilience would require proactive planning for maximizing the attainment of SDGs alongside planning for climate adaptation.
- *Disaster Risk Reduction*: Risk of natural disasters exacerbated by climate change remains the most widespread and consequential threat to climate vulnerable communities. Community-based adaptation programs can significantly improve emergency preparedness, reduce loss of life and property, and deliver well-coordinated responses at the local level.

2.6 Conclusions

Climate change is an evolving, intensifying, and multidimensional global environmental threat that is endangering vulnerable communities in South Asia and many

other parts of the world. Many of these communities are already faced with a host of development challenges such as poverty, poor access to education and health services, and inadequate infrastructure. Progress to improve socioeconomic well-being in these communities is stymied by climate risks—often resulting in loss of livelihood and climate-induced migration. The global community has been slow to come up with the necessary international agreements, institutions, and financing to drive aggressive mitigation measures in the developed countries and support comprehensive adaptation programs in developing countries. The adaptation gap including the financing gap persists at the global level preventing more substantial investments in adaptation to climate change.

CBA initiatives that focus on the climate vulnerable population and bottom-up approaches offer a beacon of hope in this uncertain world. They present opportunities for innovation in developing place-based, community-engaged, resource-efficient, cost-effective, and sustainable responses to climate risks through better coordination of the actors and enablers (see Fig. 2.1).

CBA in the past has been ad hoc and often driven by necessity at the community level. There are many isolated examples of creative initiatives on livelihood diversification, resource management, and capacity building as well as innovative financing and infrastructure schemes to improve adaptive capacity in communities (see Fig 2.3).

There are also unique examples of adaptation initiatives that focus on building community resilience that are yet to be mainstreamed. While progress has been made toward achieving the SDGs and DRR, these initiatives have not been widely linked with climate adaptation and the results have not been uniform across different geographic areas and vulnerable groups.

A framework based on a holistic approach to community-based adaptation that embodies the resilience principles with explicit links to SDG attainment and DRR, as presented in Fig. 2.4, offers a new and more effective way for building resilience in climate vulnerable communities.

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