

REVIEW

Community-Based Adaptation to Climate Change Management: Global Evidence, Effectiveness, and Policy Directions

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ABSTRACT

Community-Based Adaptation has emerged as a vital approach to addressing the local impacts of climate change Management, particularly in vulnerable communities. This review examines the development, efficacy, and policy implications of Community-Based Adaptation, with a focus on its contribution to resilience and transformative adaptation. Community-Based Adaptation works with communities to design and implement climate adaptation strategies tailored to local contexts through the integration of local knowledge, community empowerment, and participatory decision-making. Although Community-Based Adaptation has proved successful in areas such as agriculture, water management, and disaster risk reduction, issues of scalability, financial sustainability, and social equity have been problematic. The review addresses how Community-Based Adaptation can be involved in transformative adaptation by addressing the cause of the vulnerability, such as social and economic inequalities. It further emphasizes the need to incorporate Community-Based Adaptation in the national and global strategies of climate change, long-term support, and inclusive governance. This review, in the end, offers a broad framework of the future development of Community-Based Adaptation as a fundamental aspect of climate resilience, providing policy ideas to maximize and maintain local adaptation activities.

Keywords: Community-Based Adaptation Management (CBAM); Climate Resilience; Transformative Adaptation; Participatory Governance; Climate Policy

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1. Introduction: Motivation and Scope

One of the most immediate problems of the global community nowadays is climate change. Its effects are already being experienced in most parts of the world, particularly in vulnerable areas like low-lying coastal areas, small island developing states, and rural communities that are largely reliant on natural resources. Due to a rising number of extreme weather phenomena and their intensity, the necessity of useful adaptation policies grows more pressing. Conventional top-down, government-centered adaptation response, though significant, is usually not enough to respond to the diverse and local implications of climate change. This is where Community-Based Adaptation Management (CBAM) is involved. CBAM is a change towards more local, participatory, and context-sensitive approaches to adaptation, where the communities are given the power to develop and implement their own strategies to mitigate their unique vulnerabilities^[1].

This review is inspired by the realization that increased focus is placed on the idea that adaptation is not only about climate-proofing but also about the social, political, and economic factors underlying vulnerability. Community-based solutions are perceived to be especially promising in the context of developing resilience since they leverage local expertise, encourage social integration, and scale adaptation to the specific needs and priorities of communities. In essence, with CBAM, a more holistic and sustainable impact is achieved as the adaptation strategies must be not only effective in an environmental sense but also socially fair, politically practical, and culturally acceptable^[2,3].

Nevertheless, the conceptual bases of the given approach are in many ways insufficiently developed, despite the growing interest devoted to the issue of CBAM in the literature and policy-making environment. Community-based adaptation has been applied but in various contexts and usage in other fields; hence, there is no performance of the term being specific in respect to its meaning, scope and association with other adaptation strategies, which include ecosystem-based adaptation, disaster risk reduction (DRR), and participatory development. Such conceptual vagueness is further enhanced by the variety of projects and interventions that are packaged under the name of CBAM with different degrees

of success and effectiveness. Considering these issues, it is urgent to improve the theoretical perspectives on which the CBAM is based, quantify its efficacy, and seek ways to effectively incorporate it into larger national and global approaches to adaptation^[2,4].

The current review aims to close these gaps by critically analyzing the conceptual evolution, theoretical foundations, and supporting empirical evidence on CBAM. The first one is to create a synthesis of the existing literature and clarify the main concepts, outline the strong and weak points, and criticize the theoretical arguments that have appeared in regard to the approach. This way, this review will identify the opportunities of CBAM to lead transformational adaptation, discuss the obstacles to its promulgation, and identify the policy priorities to expand community-based adaptation efforts on an international scale^[5,6].

The breadth of this review is two-fold. It is first going to evaluate the conceptual clarity of CBAM, its development, and its separation from similar notions like local adaptation, ecosystem-based adaptation, and disaster risk reduction. Second, it will discuss the practical implications of CBAM in reviewing case studies and global empirical data, discussing its achievements, problematic issues, and constraints. Pulling examples of the world's experiences across diverse industries, such as water management, agriculture, disaster risk reduction, and health, the review will offer subtle insight into how CBAM operates in various settings and how it operates in dissimilar conditions. Moreover, the review is going to be critically involved in the overall theoretical discussions of CBAM, with references to the way it is correlated with such concepts as social capital, resilience, and transformative adaptation. This review aims to respond to some of the main questions^[7]. What is Community-Based Adaptation, and how is it defined and conceptualized in the literature, and what are the differences to other strategies of adaptation? What are the theoretical underpinnings of CBAM, and how do they influence practice? What is the effectiveness of CBAM in strengthening community-level resilience, and what is the evidence on its effect on the reduction of vulnerability and adaptive capacity? What are the obstacles to the successful implementation and scaling of CBAM, and what can be done to overcome these barriers? What policy and institutional actions are required to include CBAM in national and global systems of adaptation, to achieve long-term

sustainability and influence?

The answers to these questions will not only bring about a better insight into CBAM, but they will also help understand how community-based strategies can be better applied and expanded to pursue global climate resilience. The paper will end with a debate on future research and policy direction, as to how CBAM can be implemented in the global climate adaptation measures^[8–10].

Overall, this review will serve as a valuable tool to scholars, policymakers, and practitioners working with community-based adaptation, as it will offer a comprehensive overview of the conceptual, theoretical, and practical aspects of the issue and identify the ways forward to make adaptation more resilient, sustainable, and equitable in the face of climate change.

2. Conceptual Foundations and Evolution of Community-Based Adaptation Management(CBAM)

2.1. Historical Development of Community-Based Adaptation Management

The Community-Based Adaptation Management (CBAM) concept developed as a response to the fact that the most vulnerable groups are the ones that are most exposed to climate change, particularly those in developing nations, rural communities, and those in the region that are vulnerable to environmental shocks. Conventionally, climate change adaptation was considered to be a top-down process, which was mainly led by national governments and international organizations. Nevertheless, this *modus operandi* usually ignores the local knowledge and capabilities of communities, which are significant in interpreting and solving certain environmental issues. The development of CBAM as a separate field of study and practice over the last several decades has shifted to more participatory, locally-based, and context-specific types of adaptation^[9,11].

The history of CBAM extends to the participatory development and disaster risk reduction (DRR) movements that were active in the late 20th century. These movements were keen on incorporating the role of the community in making decisions, as it was realized that the local populations are the ones who have a lot to share in terms of vulnera-

ble populations and their adaptive abilities. The integration of climate change adaptation into community development models was predetermined by early community-based efforts in the 1990s, which were usually disaster preparedness and recovery-related^[12].

CBAM was formalized in the early 2000s as organizations such as the International Institute of Environment and Development (IIED) and the United Nations Framework Convention on Climate Change (UNFCCC) realized the need in the relevance of local engagement in climate adaptation. In 2006, the UNFCCC brought into understanding a notion of community-based adaptation, as it provided an adaptation fund, which explicitly propagated the concept of enabling local communities to act in order to deal with climate-related issues. This was also the time when the Community-Based Adaptation to Climate Change Management (CBAM) conference series was established to become a leading source of knowledge sharing and experience of local adaptation practices to cement the concept of CBA in the academic and policy communities^[9,13,14].

This has since made CBAM a fundamental part of global climate adaptation plans, especially the Paris Agreement and Sustainable Development Goals (SDGs). This development can be seen in the growing understanding that successful adaptation to climate needs to be locally-based, involving communities and incorporating the local agenda in the wider national and international systems.

2.2. Core Characteristics of Community-Based Adaptation Management

In its very essence, CBAM is unique due to several distinctive features that make it stand out from the crowd of other methods of adaptation, especially the top-down and government-driven ones. These are local knowledge integration, community empowerment, and participatory decision-making. These characteristics are useful in ensuring that the adaptation measures are not only technically sound but also socially, culturally, and economically acceptable to the communities to which they are intended to serve^[15,16]. **Figure 1** presents a conceptual framework of CBAM, which demonstrates that local knowledge contributes to the process of adaptation planning to enable the communities to design solutions in ways that suit their needs and priorities.

CBAM encourages ownership and sustainability of adaptation actions through incorporating local knowledge, creating inclusive participation.

The use of local knowledge and experiences is one of the characteristics of CBAM and its efforts in vulnerability identification and adaptation measures design. Local communities have the information on the environment, livelihoods, and coping mechanisms in finer detail that might not

be reflected in the traditional scientific and technical measures. Based on this insight, CBAM enables the creation of solutions that are more applicable, less expensive, and have higher chances of acceptance by the community. To illustrate, the example of indigenous agriculture or water management practices elaborated over the generations may provide a lot of useful information on the sustainable adaptation strategy^[9,17].

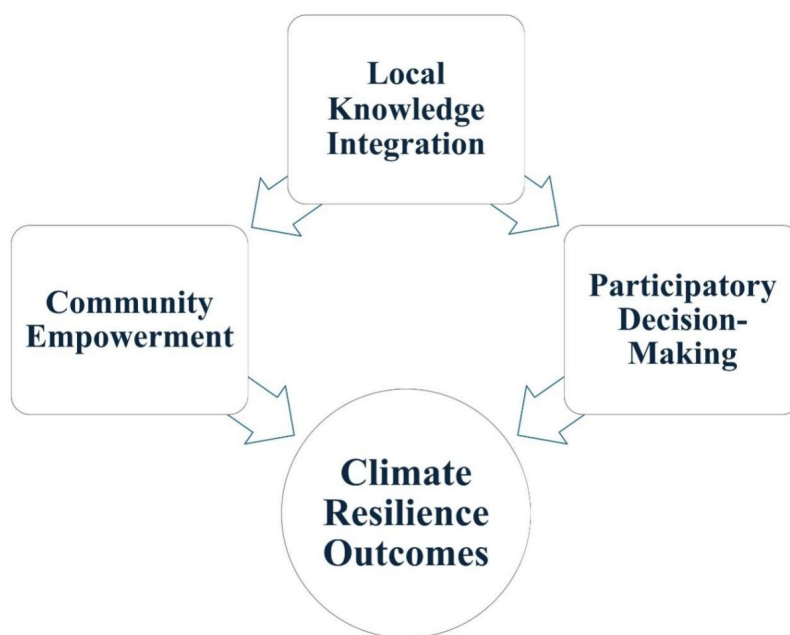


Figure 1. Conceptual Framework of Community-Based Adaptation Management (CBAM).

CBAM is essentially concerned with the communities in charge of their adaptation. This is achieved by viewing communities as change agents and not passive receivers of externally designed solutions. CBAM's definition of empowerment refers to the development of the ability of the local people to recognize their weaknesses, evaluate possible risks, and develop and execute adaptation strategies that mirror their needs and priorities. This may usually be done by capacity building, development of skills, and easy access to information and resources^[17].

One of the principles of CBAM is the emphasis on participation in government. When communities take an active part in the decision-making process at the very beginning, it is more likely that the adaptation strategies will be successful. This participatory strategy makes adaptation measures work in line with local needs, priorities and preferences. In addition, it makes one feel that they own it, and this may make

the interventions sustainable in the long run. Participatory decision-making is also useful in overcoming the imbalance of power within communities, as marginalized groups, like women, young people and indigenous people, get a chance to be heard in the decisions that are to be made in adaptation planning^[18,19].

CBAM acknowledges the heterogeneity of local contexts and emphasizes the need to use adaptation strategies that are unique to a single community. This compares to solutions that are one-size-fits-all, commonly promoted by top-down, centralized solutions. This is made possible by the flexibility associated with CBAM, whereby communities are able to come up with their own distinctive responses by considering local environmental, social and cultural aspects. This flexibility renders CBAM especially efficient when it comes to dealing with the varied and dynamic nature of the effects of climate change, which tend to have varied effects

in different areas^[11,20].

2.3. Theoretical Frameworks Supporting Community-Based Adaptation Management

The theoretical basis of CBAM consists of several theoretical frameworks representing interdisciplinary aspects in which a community resilience and adaptation process can be understood. These include:

The theory of resilience has been an important factor in designing CBAM. In this context, resilience is the ability of communities to adjust to disruptions (including climate change) without harming critical functions and structures. CBAM aims to build the resilience of people in their community by building adaptive capacity, which is the capacity of a community to envision, prepare, and act in the face of climate hazards. The theory of resilience also underlines the value of social-ecological systems since communities can be seen as part of the bigger ecosystem, and the adaptation strategies should take into consideration the human and environmental processes^[9,15].

Social capital is defined as networks, relations, and norms that allow communities to cooperate and accomplish common objectives. CBAM is frequently interested in developing social capital in the community, seeing that social networks and trust are the key to successful adaptation. Through social capital, knowledge sharing, mobilizing resources and coordinating collective action, all of which are critical to successful adaptation, can occur^[21].

The livelihoods framework offers the means of conceptualizing how various assets (including human, social, financial, physical, and natural capital) are used by individuals and communities to ensure their well-being. This framework will be especially helpful when it comes to CBAM, where there are many aspects of vulnerability to be considered and the necessity to create diverse and robust livelihoods that will be less reliant on climate-sensitive sectors (e.g., agriculture or fishing)^[22,23].

The vulnerability and adaptation theory have played a crucial role in the determination of the underlying causes of climate vulnerability and the conditions that influence adaptive capacity. CBAM uses this theory to learn about the interaction between socio-economic, political, and environmental factors to form vulnerability and how adaptation

can decrease this vulnerability in the long term. The application of this theory also highlights that adaptation should be context-dependent because various communities are vulnerable to climate risks in different ways with respect to their exposure and conditions like socio-economic status and resource access.

2.4. Debates and Critiques of CBAM

Although CBAM has already achieved a lot of ground within policy and practice, it has also experienced much criticism, especially when it comes to its scalability, equity, and effectiveness over the long run. There are several controversies about the role of CBAM in climate adaptation:

Among the greatest criticisms of CBAM is that, although participation is a core aspect of the framework, power structures in communities can still influence the course of adaptation. This critique is rooted in the political ecology of participation, where participatory processes are often shaped by existing power dynamics, with elite groups capturing the benefits of adaptation efforts while marginalized communities (such as women, the poor, or indigenous peoples) are excluded from decision-making processes. This phenomenon is commonly referred to as the “tyranny of participation”, where participation becomes a tool that reinforces existing inequalities rather than addressing them. Critics argue that unless CBAM explicitly challenges these power structures, it risks reinforcing the status quo.

To genuinely mitigate power imbalances, participatory processes in CBAM must be designed to empower marginalized groups and ensure that their voices are actively included in all stages of decision-making, from problem identification to the design and implementation of adaptation strategies. This can be achieved through institutional mechanisms such as community-based governance structures, facilitated dialogues, and inclusive leadership roles, ensuring that traditionally marginalized groups hold decision-making power. Drawing on the political ecology literature, such as the work on the “tyranny of participation” (Cooke & Kothari, 2001), we recognize that merely promoting participation is insufficient; it must be actively structured to disrupt existing power relations and create equitable processes^[24].

The second overall criticism is the difficulty in scaling up CBAM initiatives. Whereas small-scale, community-focused projects might prove successful, they can hardly be

reproduced or maintained in the long run. These may be institutional, financial, and governance constraints that will impede the effort of CBAM to scale and integrate within the frameworks of national or regional adaptations. This brings the question of how to strike a balance between local autonomy and the wider, highly coordinated adaptation processes at a greater level^[25,26].

Other researchers have held that CBAM programs might not attain the desired goals and, in fact, they might be counterproductive. Maladaptation is the term used to describe the adaptation responses that unintentionally make communities more vulnerable, such as by redistributing risks or placing communities in vulnerable courses. This can be a result of poor design of the adaptation interventions, not having a long-term view, and not involving all the stakeholders in significant ways. Despite the high potential of CBAM to create locally-driven climate adaptation, one should critically look at the limitations, challenges and possible risks of the program. The importance of such concerns is that CBAM must continue to be a disruptive means to climate resilience in the wake of global environmental change^[27].

3. CBAM in Practice: Successes, Challenges, and Limitations

CBAM Community-Based Adaptation is a growing trend of climate change adaptation, especially in areas where the exposure of people is greatest. CBAM highlights the importance of having localized, participatory, and flexible adaptation measures, which represent the individual environment, socio-economic, and cultural contexts of communities. Even though many case studies have reported the success of

CBAM across the world, there have been few challenges to its practical implementation. This part discusses the achievements and shortcomings of CBAM, giving a thorough discussion of how the initiatives have been applied in various settings and what the major aspects are that drive the performance of such initiatives^[17,28].

3.1. Successes of CBAM in Practice

Numerous examples of successful CBAM projects demonstrate the potential for local communities to build resilience to climate change through innovative, context-specific solutions. These successes are often rooted in the principles of local knowledge integration, community empowerment, and participatory decision-making^[17,29]. The successful case studies from different regions and sectors are summarized in **Table 1**. Below are several areas where CBAM has been particularly effective.

3.1.1. Water Management and Agriculture

Among the most urgent climate effects on rural populations, water shortage and irregular rain distribution should be noted. CBAM has achieved success in the improvement of local water management systems in such areas as sub-Saharan Africa, South Asia and Latin America. As an example, community-directed irrigation systems in Ethiopia and Kenya have been modified to endure the nature of water variability so that small-scale farmers are able to enhance their crop production during dry seasons. These systems take advantage of indigenous expertise in water conservation methods, including rainwater harvesting and planting of drought-resistant crops, and this enhances production, thus elevating food security in agriculture^[30,31].

Table 1. Successful Examples of Community-Based Adaptation Management (CBAM) by Region and Sector.

Region	Sector	CBAM Intervention	Key Outcomes
Sub-Saharan Africa	Water Management	Community-managed irrigation systems in Ethiopia and Kenya	Improved water availability for agriculture, increased crop yields during drought
Southeast Asia	Coastal Resilience	Mangrove restoration and coastal protection in the Philippines	Reduced vulnerability to storm surges, enhanced biodiversity, and community empowerment
South Asia (Bangladesh)	Disaster Risk Reduction	Community-led flood forecasting and response systems	Reduced mortality and property loss during floods, improved early warning systems
Latin America (Peru)	Agriculture & Livelihood	Agroforestry and drought-resistant crops in rural Peru	Increased agricultural productivity, livelihood diversification, and food security

The same case can be said in Bangladesh, where merging of conventional flood control strategies and mod-

ern technology has enabled the communities to cope well with seasonal floods. All these measures put in place, like

community-based construction of embankments, flood prediction, and early warning systems, have greatly minimized the cost of life and property in floods. The fact that this combination of local and scientific knowledge can help to deal with the complex environmental issues in a manner that is both sustainable and culturally pertinent is evidence of how effective CBAM can be^[32].

3.1.2. Disaster Risk Reduction and Resilience Building

The ability to mitigate exposure to extreme weather patterns, including cyclones, hurricanes, and droughts, can be considered one of the strongest aspects of CBAM. CBAM has given local communities authority in developing and owning their own disaster risk reduction (DRR) plans, especially in coastal communities, as is the case in the Philippines, Vietnam, and Indonesia. Training of community members around emergency preparedness, developing evacuation plans, and improving disaster-resilient infrastructure, e.g., cyclone shelters and flood barriers, is often involved in these initiatives^[33].

Taking the case of the Philippines, the local communities have embraced community-based approaches to coastal protection, such as restoring mangroves, to offset the environmental effects of storm surges and coastal erosion. Not only do the recovery of the mangrove forests offer natural defense against extreme weather, but they also assist in enhancing biodiversity and livelihood sustainability through sustainable fisheries. This strategy has been acclaimed as an effective example of ecosystem-based adaptation (EbA), and this has shown the synergistic advantages of integrating environmental restoration with the reduction of disaster risk^[34].

3.1.3. Health and Well-Being

Climate change has both direct and indirect impacts on the health of the population, especially in locations that are already weak because of poor access to medical care or due to poor sanitation facilities. CBAM has played a significant role in managing the health risks caused by climate by empowering local health care systems, enhancing awareness of the health risks posed by climate, and improving access to health care services. An example is in Kenya where community-based adaptation projects have facilitated access to clean water and sanitation facilities, which have curtailed

the spread of waterborne diseases, which are aggravated by flooding and drought^[35].

In Nepal, community health workers are trained to track and act against the emerging patterns of the distribution of virus-borne diseases like malaria and dengue, which are dependent on the alteration in the temperature and rainfall patterns. By providing the local populations with the mechanisms to identify and reduce these health hazards, the CBAM projects not only increase the health outcomes of communities, but also the general resiliency of the community to climate change^[36].

3.1.4. Livelihood Diversification and Sustainable Development

One of the most common CBAM projects is aimed at enhancing livelihoods through the diversification and adoption of climate-resilient practices. Indeed, community members in Vanuatu and Tanzania have been prepared with sustainable agriculture, agroforestry, and eco-tourism, which provide alternative sources of income but do not rely on climate-sensitive sectors. These projects usually combine the experience of sustainable management of natural resources with community-based planning, allowing the local communities to adjust to the changing climatic conditions and promote economic sustainability on a long-term basis^[37].

Equally, farmers in Malawi have involved themselves in planting climate-resistant crops like drought-resistant maize and cassava, which increases their susceptibility to unpredictable rainfall. CBAM projects are also leading to sustainable development goals (SDGs) in addition to climate adaptation through diversification of sources of income and enhancing resilience to climate through agriculture, increasing food security, poverty reduction, and gender equality.

3.2. Challenges and Barriers to Success

Although these successes are achieved, most CBAM projects have serious challenges that restrict their efficacy, scaled-up applications, and sustainability over the long term. All of these difficulties are usually associated with the problem of governance, the availability of resources, and social inequality, and can jeopardize the desired consequences of community-based initiatives. This process is depicted in **Figure 2**, and it is important to note that lessons learned in monitoring and evaluation must be injected back into the

adaptation planning of the future. With the development of adaptive management, CBAM will be able to become better over time, becoming more effective in the development of long-term resilience. A limitation of financial resources and the governance barrier can, however, affect the effectiveness

of this feedback loop, thereby highlighting the importance of powerful institutional backing and long-term financing^[38,39].

Table 2 outlines the key barriers to scaling CBAM and highlights the challenges that need to be addressed for long-term success.

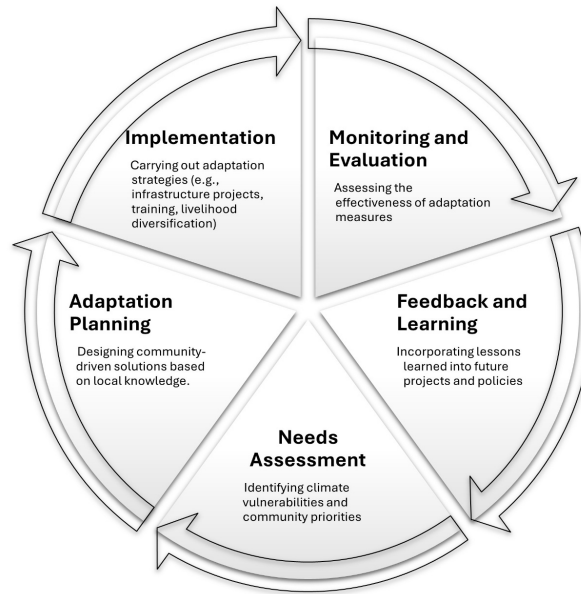


Figure 2. CBAM Implementation Process and Feedback Loops.

Table 2. Key Barriers and Challenges in Scaling Community-Based Adaptation.

Barrier	Description	Impact on CBAM
Financial Constraints	Lack of long-term, sustainable funding for local projects	Limits the implementation and scaling of CBAM initiatives
Governance Issues	Weak local governance and a lack of political will to support CBAM	Inhibits community involvement and reduces the effectiveness of adaptation measures
Social Inequality	Marginalized groups (women, indigenous people) are excluded from decision-making	Leads to inequitable adaptation outcomes and undermines community resilience
Institutional Resistance	Reluctance from national or regional authorities to integrate CBAM into larger adaptation frameworks	Reduces the integration and scaling of successful local solutions
Maladaptation Risk	CBAM projects unintentionally increase vulnerability or lock in unsustainable practices	Can lead to long-term negative impacts, undermining adaptation efforts

3.2.1. Limited Financial Resources and Funding Constraints

Inadequate financial resources are one of the major challenges to the success of CBAM. Although CBAM projects may be relatively cheaper compared to large-scale and top-down adaptation measures, initial investments are necessary to build capacity, provide technical assistance, and construct infrastructure. Most communities, especially in low-income nations, find it difficult to find funds to finance these initia-

tives. CBAM projects, in other instances, rely on short-term donor funding that may cause projects to be abandoned or discontinued at the expiry of donor funding. Moreover, the absence of climate financing that is specifically allocated to locally oriented projects implies that numerous communities have to depend on outside interventions that are donor-funded. This dependency on external funding may weaken the sustainability of CBAM projects in the long term because they may not be properly embedded in the national or local budget or governance frameworks^[39,40].

3.2.2. Governance and Institutional Constraints

The success of CBAM is highly dependent on good governance and institutional support. Nevertheless, local administrative systems, in most situations, can be flawed or unable to cope with adaptation projects. This is more so in areas where institutions of the government are disjointed, where there is no political interest to favor local adaptation, or internal contradicting interests among the levels of governance.

In certain cases, the lack of clear roles and responsibilities among the local, regional, and national actors may lead to poorly coordinated work, which diminishes the success of the CBAM initiatives. As an illustration, the local communities might not have the mandate to take adaptation action or the ability to tap into resources and technical know-how at greater levels of government. Also, policy alignment and integration can be observed as a problem with CBAM projects because the adaptation process might be excluded as a part of national plans to develop climate strategies or plans^[17].

3.2.3. Social Inequality and Marginalization

Social inequality is also another serious obstacle to the success of CBAM. CBAM may be explained as the process of empowering the local communities; however, in reality, power relations in local communities may result in exclusionary effects. The vulnerable classes, like women, indigenous peoples, and low-income households, need not be fully involved in decision-making or may not have an equal share of the adaptation initiatives.

As an example, in certain societies, the gains of CBAM projects can be unequal, as local elites or other stronger groups can capture the gains, whereas the marginalized population is left behind. This exacerbates the already existing inequalities, and the adaptation efforts can be hampered by it. It is thus important that CBAM should focus on inclusive governance, where all stakeholders are heard particularly marginalized groups and involved in the process of planning and implementing adaptation measures^[41].

3.2.4. Short-Term Focus and Maladaptation Risks

Although CBAM is supposed to facilitate long-term resilience, there have been criticisms that certain projects have been looking towards short-term coping mechanisms

instead of encouraging a transformative and sustainable adaptation. This is possibly due to the pressure to show immediate outcomes to the donors or their stakeholders, and hence, superficial solutions are taken, but they do not work on what causes the vulnerability.

Besides, the risk of maladaptation is also present, as adaptation responses can unintentionally make one more vulnerable or expose them to additional risks. An example of this is the building of flood defenses in some coastal areas, which can minimize the instant contact with storm surges and increase the chances of future development in the high-risk areas. To prevent maladaptation, CBAM projects have to have a long-term, systems approach that takes into consideration the larger social, ecological, and economic context^[20].

Community-Based Adaptation has emerged as a good strategy in responding to climate change on the local level, especially where local knowledge, community empowerment, and participatory decision-making are at the center of designing and implementing adaptation strategies. The positive experiences of water management, agriculture, disaster risk reduction, and health demonstrate how CBAM can be used to enhance adaptive capacity and resilience. Nevertheless, there are still serious problems, such as the lack of funds, the problem of governance issues, social inequality, and threats. To achieve maximum potential, CBAM needs to overcome these issues by investing more financial resources, enhancing governance, and implementing a more serious approach to inclusivity and sustainability. It is only with such efforts that CBAM can contribute to the transformative adaptation that is necessary to deal with the complex and changing effects of climate change.

4. From Incremental to Transformative Adaptation

Under the pressure of the growing climate change effects, the strategy of adaptation has changed its nature to no longer individual adaptation to short-term weather fluctuations but to big and long-term changes in social-ecological systems. This development has resulted in an increasing difference between incremental and transformative adaptation, which are two strategies that differ not only in the extent and purpose of the work but also in their ability to address the

source of vulnerability. Within the discussion of transformative adaptation, Community-Based Adaptation (CBA) has been considered an incremental approach that has, in recent instances, been related to transformative adaptation, especially in moving beyond the coping responses of the system to pursue systemic changes. The section in question delves into discussing the shift between incremental and transformative adaptation, their key features, issues surrounding them, and the possibility of CBAM contributing to transformative adaptation in the local societies^[42].

4.1. Defining Incremental and Transformative Adaptation

Incremental Adaptation is a type of adaptation strategies that entail minor changes or alterations to the existing systems, practices, or structures to address the effects of climate change. Such adaptations are generally intended to preserve the status quo or to enhance the resilience of the current systems to short-term climate variation, but without essentially changing the underlying socio-economic/environmental realities. Incremental adaptations tend to be reactive, solving short-term weaknesses, and are often instituted at the community or local scale. An example of this is overcoming drought by using more drought-resistant varieties of crops, fortifying flood defenses to defend infrastructure, or implementing better methods of water management in line with changing precipitation levels, all of which are types of incremental adaptation^[43].

Although incremental adaptation may be useful in the short term, it is more inclined to concentrate on coping rather than changing the systems that cause vulnerability. This

strategy can strengthen the status quo and injustices that may exist within its presence if it does not consider the social, economic, and political determinants of vulnerability. Further, there may be a constraint on the capacity of incremental adaptation to more complex and long-lasting changes in climate, including the irreversible effects of sea-level rise or desertification. Transformative Adaptation, in its turn, implies systemic changes of deeper social-ecological systems. Transformative adaptation does not simply adapt to the effects of climate, but aims instead to reorganize the systems that create vulnerability, which can be the fundamental cause of inequality, failure in governance, and destruction of the environment. It entails reimagining current practices, current structures, and relationships, whether in the agricultural sector, water management, governance, or economic systems, to create stronger, more equitable, and sustainable systems^[43].

Transformative adaptation tends to be proactive, long-term, and directed at changing the causes of vulnerability (poverty), unequal access to resources, and environmental damage. Moving from flood protection to natural floodplain restoration, or the use of drought-tolerant crop varieties, to changing agricultural practices to agroecological systems that combine biodiversity and ecosystem services, may be regarded as transitional adaptation. The changes are designed to produce the conditions that are required to achieve social justice, ecological sustainability, and long-term resilience, and not merely to alleviate the short-term effects of the changes in climate change^[43,44]. The differences between incremental and transformative adaptation are summarized in **Table 3**, which contrasts their objectives, scope, focus, and implementation approaches.

Table 3. Key Characteristics of Incremental vs. Transformative Adaptation.

Characteristic	Incremental Adaptation	Transformative Adaptation
Objective	Short-term adjustments to maintain the status quo	Long-term systemic change to address root causes of vulnerability
Scope	Small-scale, localized adjustments	Large-scale, structural changes to socio-ecological systems
Focus	Coping with immediate impacts	Reshaping systems for future climate resilience
Implementation Approach	Reactive, often driven by immediate climate impacts	Proactive, anticipatory, often involving fundamental shifts
Examples	Improved flood defenses, drought-resistant crops	Ecosystem restoration, socio-economic restructuring, governance reform
Impact	Stabilizes existing systems	Enhances long-term resilience and social-ecological sustainability

The major distinction between the two strategies is in the purpose of each. Incremental adaptation is concerned with coping and stabilization of the current systems, and

transformative adaptation is concerned with the change of the systems and redesigning of societal systems to ensure that they are resilient in response to a rapidly changing climate.

4.2. Community-Based Adaptation Management and the Potential for Transformative Change

Although CBAM is commonly linked to incremental adaptation owing to its orientation towards local-level solutions, it is increasingly being recognized that CBAM has the capacity to support transformative adaptation. This possibility can be explained by the fundamental features of CBAM focused on local knowledge, community empowerment, and participatory governance. These values can be a driver of bigger, more systemic transformation, in particular, when the arena of adaptation is deeper than mere adaptations to confront the organizational determinants of vulnerability^[45].

4.2.1. Local Knowledge as a Tool for Transformative Change

One of the peculiar features of CBAM is the recognition of local knowledge and community-based solutions that are interpreted as one of the factors to support transformative adaptation. Local knowledge gives a finer insight into the environmental, social, and cultural context under which adaptation takes place. Through the combination of both traditional and scientific knowledge, CBAM has the capacity to develop strategies of adaptation that will go against the prevailing paradigms of resource management, economic development, and governance. As an illustration, traditional ecological knowledge of land management, in certain Indigenous communities, may be used to facilitate agroecological practices that facilitate biodiversity, reduce reliance on external inputs, and ecological resilience^[9,17].

4.2.2. Community Empowerment and Institutional Change

Empowerment of communities to assume control of their adaptation processes is one of the central aspects of CBAM. This empowerment tends to bring about change within the institutions, whereby communities come up with new structures of governance that are more inclusive, participatory, and equitable. When communities are given powers to make decisions that concern them, there are higher chances that they will challenge the status quo and look forward to redefining their relationship with the environment, markets, and governments. Transformative adaptation in this regard may lead to new forms of governance that have a focus on sustainability, equity and resilience, redefining the political

and economic environment^[46].

Indicatively, in numerous small island developing states, CBAM has been the cause of setting up community-managed conservation spaces or marine protected spaces, which not only increase the resilience of the localities to climate change impacts such as coastal erosion and coral bleaching, but also undermine the centralized management of the natural resource. These community-controlled spaces can also promote more general changes in governance as they combine informal and formal governance systems to promote more participatory and sustainable resource management practices.

4.2.3. Addressing Root Causes of Vulnerability

Whereas the incremental adaptations are more likely to be directed towards managing the effects of vulnerability (e.g., strengthening infrastructure, altering agricultural practices), the transformative adaptation is aimed at managing the cause. When it incorporates extended social, economic, and environmental circumstances, CBAM can be very significant in confronting the forces of vulnerability, e.g., poverty, inequality, and unsustainable consumption of resources. To illustrate, livelihood diversification projects, gender equality, or land tenure security projects are not short-term coping strategies as they strive to deal with the structural issues that restrict the ability of people to cope with climate change. Such projects can contribute to long-term social and economic change, building fairer and more sustainable societies^[44,47].

4.2.4. Scalability and Replication of Transformative CBAM

Scalability is one of the issues that CBAM faces. Although the community-based project visions with small-scale projects can yield huge results on a local level, the incremental to transformative adaptation must be introduced systematically, which can be hard to scale up to larger levels. A successful CBAM project at the local level is not always scalable to bigger political and economic systems that are not receptive to change. Nevertheless, it is not always the case that CBAM did not scale successfully, and there are instances of scaling that have occurred through network building, policy advocacy, or integrating the local-level solutions into national adaptation plans. As an example, joint community-based natural resource management projects in such areas

as Southern Africa and Southeast Asia have been able to incorporate the local governance models into the national policy frameworks, which allows scaling up transformative adaptation practices^[48,49].

4.3. Challenges in Achieving Transformative Adaptation

Although the possibility of CBAM to help in transformative adaptation is high, there are various challenges that must be overcome so as to achieve this potential in full.

4.3.1. Power Imbalances and Equity

Social equity and dealing with power imbalances existing in communities are critical to enabling CBAM to encourage transformative adaptation. In other instances, other vulnerable populations, such as women, indigenous, or marginalized ethnic groups of people, may lack the same degree of influence in decision-making processes, and therefore, they cannot be used to promote transformational change. The CBAM projects should clearly target inclusive participation and ensure that the voices of the marginalized are not excluded from the decision-making process and the leadership^[9].

4.3.2. Institutional Resistance to Change

Changing the very nature of governance processes can also lead to transformative adaptation and could not be accepted by the established institutions and authorities. Government bodies, companies, and other stakeholders might have issues adopting new practices or policies to the detriment of the current systems of power, resource allocation, or environmental handling. The solution to this resistance needs to be through political will, policy advocacy, and the alignment of CBAM activities with greater development and governance models^[50].

4.3.3. Sustainability of Transformative Changes

Another great challenge is the sustainability of transformative changes. Although CBAM has the potential to provide the preconditions to transformative adaptation, long-term success is predetermined by the need to remain engaged, build capacity consistently, and be embedded in the larger policy frameworks. Transformative changes may face a risk of reversal or undermining unless further financial, technical,

and political support is given.

The transformation of incremental to transformative adaptation is a paradigm shift in the arena of climate change adaptation, as it goes beyond short-term adaptation by coping with an issue to long-term, permanent adjustments. Although CBAM has long been viewed as a system of incremental adaptation, its capability to initiate a radical change is gaining more and more momentum, particularly in local knowledge, community, and reorganization across socio-economic systems. Nevertheless, to maximize the potential of CBAM as a transformative adaptation tool, such aspects of the method as power asymmetry, institutional opposition, and sustainability problems need to be resolved. CBAM can contribute to the development of resilient and equitable communities against climate change by encouraging sustainable, inclusive, and long-term solutions that respond to environmental and social risks of vulnerability^[51].

5. Policy Implications and Directions for Implementation

The effects of climate change are ever-increasing, and this necessitates a pressing need to have policies that would be effective in supporting and scaffolding Community-Based Adaptation Management (CBAM) strategies. Although CBAM is a promising practice in terms of local climate resilience, it must be incorporated into larger policy traditions in order to generate long-term and transformative adaptation. This part discusses the policy implications of CBAM, which presents recommendations on how this can be improved with the help of national, regional, and global policies. It is discussed how governance can play a role, how financing will be done, how the institution supports it, and how CBAM can be integrated into wider climate adaptation and sustainable development frameworks^[48].

5.1. Integrating CBAM into National and Global Climate Strategies

Among the key issues of scaling CBAM is to make sure that local and community-based solutions are integrated into national and international climate policy. International agencies and governments of countries should establish an enabling environment that can facilitate local adaptation activities and coordinate them with the global climate agendas,

including the provisions of the Paris Agreement and the Sustainable Development Goals (SDGs). Local solutions should not be a vacuum created by the policy integration of CBAM, but they must be a component of a bigger, holistic climate resilience strategy^[9,48,52]. **Figure 3** describes the main routes of integrating CBAM into these structures, which imply the necessity of multi-level governance and the alignment of local, regional, and national actors. Through the integration of CBAM into the overall climate strategies, communities will be able to receive the resources and support needed to amplify their adaptation efforts and make a contribution to the global climate targets.

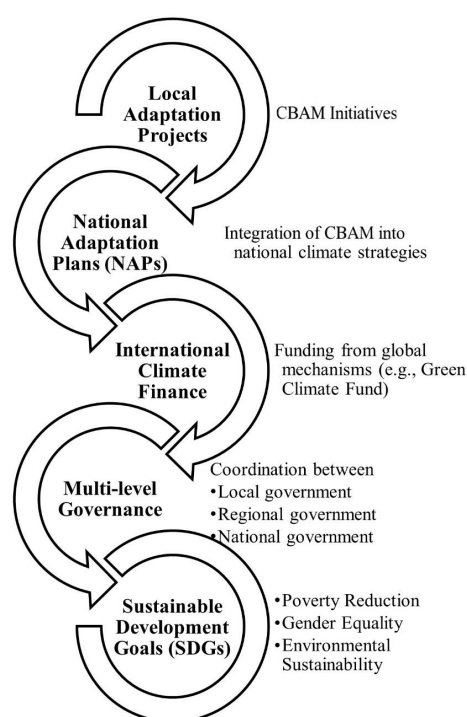


Figure 3. Pathways for Integrating CBAM into National and International Climate Strategies.

5.1.1. National Adaptation Plans (NAPs)

The signatory countries to the Paris Agreement must come up with National Adaptation Plans (NAPs) as part of their climate commitments. The plans give a guideline on how to incorporate climate adaptation plans into national development policies. As a way of ensuring the maximization of the potential of CBAM, national governments should clearly state that community-driven approaches should be part of the NAPs of governments. This may be done through making sure that CBAM projects are considered as major aspects of national adaptation plans, and also making sure

that these projects are associated with funding, capacity-building initiatives, as well as monitoring systems. Further, governments must be keen to promote the integration of local communities in the development of NAPs, such that the priorities on adaptation capture the local realities and demands^[53,54].

5.1.2. Incorporating CBAM into International Climate Finance Mechanisms

Climate finance by international organizations is very important to help in the adaptation process, especially in developing nations. But most of the prevailing funding systems tend to focus on large-scale, top-down infrastructure development, so local adaptation programs are not very well-funded. To fill this gap, international financing bodies, e.g., the Green Climate Fund (GCF), Adaptation Fund, and bilateral donors, will have to establish financing windows that are specifically aimed at financing CBAM initiatives. This also incorporates the capacity-building funds, participatory planning funds, and community-based monitoring and evaluation funds. Also, financial allocation needs to be focused on projects with the aim of transformative adaptation through targeting the underlying causes of vulnerability, like poverty, inequality, and environmental degradation^[55–58].

The government and international bodies should also be aware of the need to mix finance so that CBAM projects can be financially viable. This may include the integration of public financing, private investments, as well as climate financing in order to build stronger financial packages for CBAM.

5.2. Strengthening Governance and Participatory Decision-Making

CBAM to be effective, it is essential to foster good governance at the local, regional, and national levels. CBAM thrives in environments where decision-making is inclusive, transparent, and accountable. Strengthening governance structures at all levels of society-while empowering local communities to actively participate in adaptation planning and implementation-is crucial to the success of CBAM^[9,59–62]. **Figure 4** demonstrates the interaction between governance at various levels, such as local, regional, and national, because they help in the scaling of CBAM. Adaptation efforts are more likely to be successful and sus-

tainable with local governments having the power to organize and execute CBAM strategies with the assistance of regional and national structures. Also, the representation of

the marginal groups in governance activities makes the process of adaptation fair and meets the needs of every member of the community.

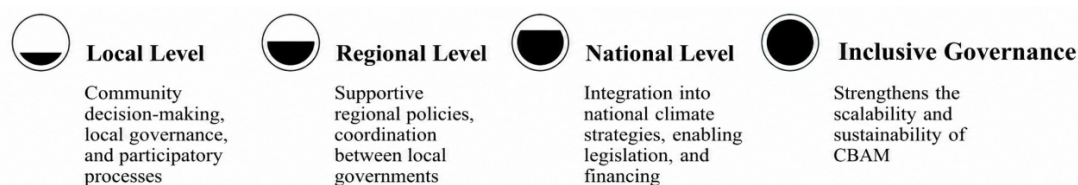


Figure 4. The Role of Governance in Scaling CBAM.

5.2.1. Multi-Level Governance and Decentralization

The key to successful climate adaptation is local action and cooperation between the national governments and communities. This can be supported by multi-level governance, whereby there is decentralization in the decision-making process and sharing of responsibilities between different levels of governance. The national governments are advised to establish structures that promote decentralization of decision-making so that the local governments are given power, resources, and technical skills to assist community-based adaptation. Specifically, the role of local governments in arranging CBAM initiatives should be at the center stage of ensuring that the local CBAM initiatives are harmonized with the country-wide adaptation policies and priorities, as well as the needs and priorities of local communities^[63,64].

Moreover, cross-sectoral coordination is the key to making CBAM strategies linked with the development agendas that are more comprehensive, which may include agriculture, water management, health, and disaster risk reduction. Structures of governance that encourage cross-sectoral and cross-level governmental partnerships are more apt to result in holistic and sustainable solutions^[65–67].

5.2.2. Inclusive and Participatory Decision-Making

Community participation is one of the main principles of CBAM, but in practice, the extent of involvement may be different. Policymakers should make sure that the process of CBAM is truly inclusive, as marginalized groups, including women, indigenous people, youth, and low-income families, should make meaningful contributions to its decisions. This is more crucial in societies that have power disparities or

social inequalities that can restrict the contributions of some groups of people^[68].

The formation of participatory platforms like community councils or advisory boards, where stakeholders can meet to discuss the risks of climate and the adaptation options, should be encouraged with the help of policies. Moreover, community-led planning and bottom-up governance mechanisms are to be incorporated into the climate policy frameworks so that the adaptation measures are based on local knowledge, priorities, and values.

5.3. Financing and Resource Mobilization

CBAM initiatives would require adequate and sustained funding in order to succeed. The finite resource of finances will make even the best community-based projects, which are planned to attain meaningful results or scale up to fail. Therefore, there is an urgent need to put in place powerful financing strategies that focus on community-based adaptation^[41].

5.3.1. Innovative Financing Models for CBAM

The funding of CBAM should not only be limited to the conventional donor-funded undertakings but should also incorporate the new models that utilize various sources of funds. As an example, so-called blended finance (a mix of public and private funds) may be critical to scaling up CBAM programs. This model is capable of assisting in attracting the investments of the private sector, especially in areas such as agriculture, energy, and infrastructure, where the benefits of the climate resilience strategies can provide some long-term economic benefits. Also, communities can be given the financial strength to handle the effects of climate shocks using climate risk insurance and microfinance schemes^[69].

5.3.2. Long-Term Funding Security

The main weakness of most CBAM projects is that they rely on short-term donor funding, and this may result in the project being discontinued or lacking sustainability in the future when the funding dries up. To overcome this problem, the governments of countries should put more emphasis on the long-term funding systems of the community-based projects. This may involve setting up climate adaptation funds at the local or regional level, to be used as resources in the continuing adaptation demands. Besides, CBAM projects should be incorporated into the national and local budgets to institutionalize the adaptation activities to prevent dependence on external funding^[69].

5.3.3. Leveraging Local Knowledge and Resources

Although outside funding is critical, CBAM could also take advantage of using local resources. These are local knowledge, which may result in cost-effective solutions, and community labor and volunteering, which in most cases form the basis of effective adaptation efforts. Using local resources in the financing plans will mean that CBAM projects will create a stronger resilience without relying too much on external support^[70].

5.4. Policy Integration with Sustainable Development Goals (SDGs)

CBAM can make a strong contribution towards the realization of Sustainable Development Goals (SDGs), particularly those concerning the reduction of poverty (SDG 1), gender equality (SDG 5), clean water and sanitation (SDG 6), decent work and economic growth (SDG 8), and climate

action (SDG 13). Including CBAM in national and international sustainable development systems may serve to ensure that the process of adaptation is geared towards the larger development goals^[71].

5.4.1. Aligning CBAM with National Development Plans

CBAM strategies should be incorporated into wider national development frameworks, whereby adaptation and development goals are taken into consideration. This will involve changing the way the problem of adaptation is perceived as a separate issue instead of a part of sustainable development. As an illustration of this, climate resilience considerations, especially at the community level, should be included in policies touching on the development of infrastructure, land use, and disaster risk reduction^[46].

5.4.2. Gender and Social Equity in CBAM

The strategies of climate adaptation have to focus on social equity, such that all groups, including vulnerable populations, should be accommodated in the process. The issue of gender equality, especially for women, is a particularly important factor to be taken into consideration since women tend to be more affected by the climate change imbalance, but also, they hold specific knowledge and coping mechanisms. Gender-sensitive CBAM can be supported through policies that can help build greater resilience by making sure women and men have equal access to resources, decision-making, and leadership in the planning of the adaptation^[24,72,73]. Important policy recommendations for enhancing CBAM implementation, including the need for improved financing, capacity-building, and integration into SDGs are presented in **Table 4**.

Table 4. Policy Recommendations for Enhancing CBAM Implementation.

Policy Area	Recommendation	Expected Outcome
Integration into National Plans	Include CBAM in National Adaptation Plans (NAPs) and climate policies	Strengthened policy alignment between local and national adaptation strategies
Financing Mechanisms	Establish dedicated funding streams for community-driven adaptation	Increased financial support for CBAM initiatives, ensuring long-term sustainability
Inclusive Governance	Promote participatory decision-making, ensuring the inclusion of marginalized groups	More equitable adaptation outcomes, fostering social cohesion and resilience
Capacity Building	Support training programs for local governments and communities on adaptation techniques	Improved local technical capacity, better implementation and management of adaptation strategies
Monitoring and Evaluation	Implement robust monitoring and evaluation frameworks for CBAM projects	Enhanced learning, accountability, and adaptation of strategies based on results

5.5. Policy Recommendations for Scaling CBAM

In order to ensure the scaling of CBA successfully and fulfill its potential of introducing transformational climate adaptation, policy frameworks on local, national, and international levels are needed. Such policies must focus on how Community-Based Adaptation Management (CBAM) can be integrated into national and global climate policy-making so that local solutions are included in the larger adaptation systems. It is also necessary to strengthen the governance systems to encourage inclusive and participatory decision-making and encourage collaboration between governments, communities, and stakeholders on a multi-level basis. Also, it is important to establish innovative financing mechanisms to access long-term financing for community-led adaptation projects. Finally, CBAM needs to be aligned with sustainable development goals as well to make sure that adaptation activities lead to other, more global goals of social, economic, and environmental sustainability. By solving these policy issues, CBAM can be instrumental in ensuring climate resilience, especially in vulnerable communities, and a portion of global climate and development objectives^[42,46,48,74].

6. Conclusion

Community-Based Adaptation Management (CBAM) has become an important method of tackling the complex issues of climate change, especially for the vulnerable communities that are most affected. As noted in this review, CBAM has the potential to transform the way local knowledge, community empowerment, and participatory decision-making are incorporated to design and implement adaptation strategies. Although CBAM has long been linked with the concept of incremental adaptation, it is becoming more and more consistent with the concepts of transformative adaptation, in that it does not just aim at living with the effects of climate change but also at creating a long-term, systemic change that underlies the vulnerability. The effectiveness of CBAM is evidenced by its success in various areas such as water management issues in sub-Saharan Africa and coastal resilience in Southeast Asia, among other moving-forward-oriented areas. Nevertheless, the scalability and sustainability of CBAM initiatives have been seen to be a problem because

they are usually limited by financial constraints, governance, and social disparities. In order to achieve the full potential of CBAM, the above barriers must be addressed by inclusive governance, creative financing mechanisms, and integration of the policies in national and global climate strategies.

This review highlights the need to align CBAM to wider climate adaptation frameworks such as National Adaptation Plans (NAPs) and international climate finance frameworks in order to make sure that local solutions are incorporated in national and global climate objectives. In addition, empowering multi-level governance and developing effective partnerships between governments, communities, and international organizations will improve the ability of the local communities to spearhead climate resilience.

With the growing impacts of climate change threatening the world with threats that have never been experienced in history, transformative and community-based adaptation has never been timelier. CBAM provides an avenue for building more equitable, sustainable and resilient societies by seeking to not only tackle the environmental issues but also the social and political factors of vulnerability. Going ahead, policymakers, practitioners, as well as researchers should keep building frameworks that can help the scaling up of CBAM so that it becomes a part of the global fight to address climate change. In conclusion, climate adaptation of the future is to allow communities to take the lead and create ground-up resilience, and help create a more sustainable and fairer world. With a multi-faceted policy approach, financial investments, and community-based action, CBAM can contribute to the overall objectives of climate resiliency and sustainable development in such a way that no one will be forgotten due to climate change.

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References

- [1] Urry, J., 2015. Climate Change and Society. In: Michie, J., Cooper, C.L. (eds.). *Why the Social Sciences Matter*. Palgrave Macmillan: London, UK. pp. 45–59. DOI: https://doi.org/10.1057/9781137269928_4
- [2] Ayers, J., Forsyth, T., 2009. Community-Based Adaptation to Climate Change. *Environment: Science and Policy for Sustainable Development*. 51(4), 22–31. DOI: <https://doi.org/10.3200/ENV.51.4.22-31>
- [3] Nukusheva, A., Ilyassova, G., Rustembekova, D., et al., 2021. Global warming problem faced by the international community: international legal aspect. *International Environmental Agreements: Politics, Law and Economics*. 21(2), 219–233. DOI: <https://doi.org/10.1007/s10784-020-09500-9>
- [4] Brundtland, G.H., 1989. Global Change and Our Common Future. *Environment: Science and Policy for Sustainable Development*. 31(5), 16–43. DOI: <https://doi.org/10.1080/00139157.1989.9928941>
- [5] Turner, R.K., 2007. Limits to CBA in UK and European environmental policy: retrospects and future prospects. *Environmental and Resource Economics*. 37(1), 253–269. DOI: <https://doi.org/10.1007/s10640-007-9119-2>
- [6] Odek, R., Oluoch, J., 2023. Cost Benefit Analysis Origin And Applicability Of Its Recent Advances: A Critical Review. *Management and Economics Research Journal*. 9(1), 1–11.
- [7] Mårstøl, M.N., 2020. ‘Grounding’ Ecosystem-Based Adaptation in the Western Cape Province [Master’s Thesis]. University of Cape Town: Cape Town, South Africa.
- [8] Camacho, A.E., Glicksman, R.L., 2016. Legal adaptive capacity; how program goals and processes shape federal land adaptation to climate change. *University of Colorado Law Review*. 87, 711.
- [9] Kirkby, P., Williams, C., Huq, S., 2018. Community-based adaptation (CBA): adding conceptual clarity to the approach, and establishing its principles and challenges. *Climate and Development*. 10(7), 577–589. DOI: <https://doi.org/10.1080/17565529.2017.1372265>
- [10] Lecocq, F., Hallegatte, S., De Perthuis, C., 2011. *Designing Climate Change Adaptation Policies: An Economic Framework*. World Bank: Washington, DC, USA.
- [11] Forsyth, T., 2013. Community-based adaptation: a review of past and future challenges. *WIREs Climate Change*. 4(5), 439–446. DOI: <https://doi.org/10.1002/wcc.231>
- [12] Chadburn, O., Anderson, C., Venton, C.C., et al., 2013. *Applying Cost Benefit Analysis at a Community Level: A Review of Its Use for Community Based Climate and Disaster Risk Management*. Oxfam: Oxford, UK.
- [13] Reid, H., Coirolo, C., Christensen, K., et al., 2013. *Community Based Adaptation: Mainstreaming CBA into National and Local Planning*. IIED: London, UK.
- [14] Francisco, H.A., 2008. *Adaptation to Climate Change: Needs and Opportunities in Southeast Asia*. *Asean Economic Bulletin*. 25(1), 7–19. DOI: <https://doi.org/10.1355/AE25-1B>
- [15] Joseph, R., Proverbs, D., Lamond, J., et al., 2014. Application of the concept of cost benefits analysis (CBA) to property level flood risk adaptation measures: A conceptual framework for residential. *Structural Survey*. 32(2), 102–122. DOI: <https://doi.org/10.1108/SS-12-2012-0043>
- [16] Turner, R.K., Schaafsma, M., Mee, L., et al., 2015. *Conceptual Framework*. In: Turner, R. Kerry, Schaafsma, M. (eds.). *Coastal Zones Ecosystem Services: From Science to Values and Decision Making*. Springer International Publishing: Cham, Switzerland. pp. 11–40. DOI: https://doi.org/10.1007/978-3-319-17214-9_2
- [17] Sekine, H., Fukuhara, K., Uruguchi, A., et al., 2009. *The Effectiveness of Community-based Adaptation (CBA) to Climate Change: From the Viewpoint of Social Capital and Indigenous Knowledge*. Global Environment Information Centre: Tokyo, Japan.
- [18] Irvin, R.A., Stansbury, J., 2004. Citizen Participation in Decision Making: Is It Worth the Effort? *Public Administration Review*. 64(1), 55–65. DOI: <https://doi.org/10.1111/j.1540-6210.2004.00346.x>
- [19] Annema, J.A., 2013. The use of CBA in decision-making on mega-projects: empirical evidence. In: Priemus, H., Van Wee, B. (eds.). *International Handbook on Mega-Projects*. Edward Elgar Publishing: Cheltenham, UK. DOI: <https://doi.org/10.4337/9781781002308.00021>
- [20] Ensor, J.E., Park, S.E., Attwood, S.J., et al., 2018. Can community-based adaptation increase resilience? *Climate and Development*. 10(2), 134–151. DOI: <https://doi.org/10.1080/17565529.2016.1223595>
- [21] Bhandari, H., Yasunobu, K., 2009. What is Social Capital? A Comprehensive Review of the Concept.

- Asian Journal of Social Science. 37(3), 480–510. DOI: <https://doi.org/10.1163/156853109X436847>
- [22] Rakodi, C., 1999. A Capital Assets Framework for Analysing Household Livelihood Strategies: Implications for Policy. *Development Policy Review*. 17(3), 315–342. DOI: <https://doi.org/10.1111/1467-7679.00090>
- [23] Bebbington, A., 1999. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. *World Development*. 27(12), 2021–2044. DOI: [https://doi.org/10.1016/S0305-750X\(99\)00104-7](https://doi.org/10.1016/S0305-750X(99)00104-7)
- [24] Annema, J.A., Mouter, N., Razaei, J., 2015. Cost-benefit Analysis (CBA), or Multi-criteria Decision-making (MCDM) or Both: Politicians' Perspective in Transport Policy Appraisal. *Transportation Research Procedia*. 10, 788–797. DOI: <https://doi.org/10.1016/j.trpro.2015.09.032>
- [25] Stirling, A., Coburn, J., 2018. From CBA to Precautionary Appraisal: Practical Responses to Intractable Problems. *Hastings Center Report*. 48(S1), S78–S87. DOI: <https://doi.org/10.1002/hast.823>
- [26] Vickerman, R., 2007. Cost — Benefit Analysis and Large-Scale Infrastructure Projects: State of the Art and Challenges. *Environment and Planning B: Planning and Design*. 34(4), 598–610. DOI: <https://doi.org/10.1068/b32112>
- [27] Florio, M., Sartori, D., 2016. Getting Incentives Right: Do We Need Ex Post Cba? SSRN. DOI: <https://doi.org/10.2139/ssrn.2723423>
- [28] Forsyth, T., 2017. Community-Based Adaptation to Climate Change. In: Von Storch, H. (ed.). *Oxford Research Encyclopedia of Climate Science*. Oxford University Press: New York, NY, USA. DOI: <https://doi.org/10.1093/acrefore/9780190228620.013.602>
- [29] Roy, R., 2018. Evaluating the Suitability of Community-Based Adaptation: A Case Study of Bangladesh. In: Leal Filho, W., Manolas, E., Azul, A.M., et al. (eds.). *Handbook of Climate Change Communication: Vol. 1: Theory of Climate Change Communication*. Springer International Publishing: Cham, Switzerland. pp. 39–59. DOI: https://doi.org/10.1007/978-3-319-69838-0_3
- [30] Mutambara, S., Darkoh, M.B.K., Athlopheng, J.R., 2016. A comparative review of water management sustainability challenges in smallholder irrigation schemes in Africa and Asia. *Agricultural Water Management*. 171, 63–72. DOI: <https://doi.org/10.1016/j.agwat.2016.03.010>
- [31] Ahmed, Z., Gui, D., Qi, Z., et al., 2022. Poverty reduction through water interventions: A review of approaches in sub-Saharan Africa and South Asia. *Irrigation and Drainage*. 71(3), 539–558. DOI: <https://doi.org/10.1002/ird.2680>
- [32] Gain, A., Mondal, M., Rahman, R., 2017. From Flood Control to Water Management: A Journey of Bangladesh towards Integrated Water Resources Management. *Water*. 9(1), 55. DOI: <https://doi.org/10.3390/w9010055>
- [33] Mechler, R., 2016. Reviewing estimates of the economic efficiency of disaster risk management: opportunities and limitations of using risk-based cost–benefit analysis. *Natural Hazards*. 81(3), 2121–2147. DOI: <https://doi.org/10.1007/s11069-016-2170-y>
- [34] Gevaña, D.T., Pulhin, J.M., Tapia, M.A., 2019. Fostering Climate Change Mitigation Through a Community-Based Approach: Carbon Stock Potential of Community-Managed Mangroves in the Philippines. In *Coastal Management*. Academic Press: London, UK. pp. 271–282. DOI: <https://doi.org/10.1016/B978-0-12-810473-6.00014-5>
- [35] St. Louis, M.E., Hess, J.J., 2008. Climate Change: Impacts on and Implications for Global Health. *American Journal of Preventive Medicine*. 35(5), 527–538. DOI: <https://doi.org/10.1016/j.amepre.2008.08.023>
- [36] Aparecida Sperança, M. (ed.), 2024. *Epidemic Preparedness and Control*. IntechOpen: London, UK. DOI: <https://doi.org/10.5772/intechopen.12363>
- [37] Sabates-Wheeler, R., Mitchell, T., Ellis, F., 2009. Avoiding Repetition: Time for CBA to Engage with the Livelihoods Literature? *IDS Bulletin*. 39(4), 53–59. DOI: <https://doi.org/10.1111/j.1759-5436.2008.tb00476.x>
- [38] Dopheide, E., 2016. Use and Understanding of CBA in the Evaluation of Infrastructure and Spatial Projects. In *Place-Based Evaluation for Integrated Land-Use Management*. Ashgate Publishing: Farnham, UK. pp. 249–260.
- [39] Chambwera, M., Campos, M.R., Obermaier, M., et al., 2014. The Economics of CBA. In: Schipper, E.L., Ayers, J., Reid, H., et al. (eds.) *Community-Based Adaptation to Climate Change*. Routledge: London, UK. pp. 55–74.
- [40] Korytárová, J., Papežíková, P., 2015. Assessment of Large-Scale Projects Based on CBA. *Procedia Computer Science*. 64, 736–743. DOI: <https://doi.org/10.1016/j.procs.2015.08.602>
- [41] Purcell, I., 2020. *Measuring the Effectiveness of Community Benefit Agreements: What Factors Make a Successful CBA [PhD Thesis]? Haverford College: Haverford, PA, USA.*
- [42] Mfitumukiza, D., Roy, A.S., Sinha, A., et al., 2020. *Scaling Local and Community-Based Adaptation*. Global Center on Adaptation: Rotterdam, The Netherlands.
- [43] Roggema, R., Vermeend, T., Dobbeltstein, A., 2012. Incremental Change, Transition or Transformation? Optimising Change Pathways for Climate Adaptation in Spatial Planning. *Sustainability*. 4(10), 2525–2549. DOI: <https://doi.org/10.3390/su4102525>

- [44] Kates, R.W., Travis, W.R., Wilbanks, T.J., 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*. 109(19), 7156–7161. DOI: <https://doi.org/10.1073/pnas.1115521109>
- [45] Dodman, D., Mitlin, D., 2013. Challenges for Community-Based Adaptation: Discovering the Potential for Transformation. *Journal of International Development*. 25(5), 640–659. DOI: <https://doi.org/10.1002/jid.1772>
- [46] Regmi, B.R., Star, C., 2015. Exploring the policy environment for mainstreaming community-based adaptation (CBA) in Nepal. *International Journal of Climate Change Strategies and Management*. 7(4), 423–441. DOI: <https://doi.org/10.1108/IJCCSM-04-2014-0050>
- [47] Panda, A., 2018. Transformational adaptation of agricultural systems to climate change. *WIREs Climate Change*. 9(4), e520. DOI: <https://doi.org/10.1002/wcc.520>
- [48] Schipper, E.L., Ayers, J., Reid, H., et al., 2014. *Community-Based Adaptation to Climate Change: Scaling It Up*. Routledge: London, UK.
- [49] Dyer, J., Stringer, L.C., Dougill, A.J., et al., 2014. Assessing participatory practices in community-based natural resource management: Experiences in community engagement from southern Africa. *Journal of Environmental Management*. 137, 137–145. DOI: <https://doi.org/10.1016/j.jenvman.2013.11.057>
- [50] Lynn, L.E., 2012. *The Many Faces of Governance: Adaptation? Transformation? Both? Neither? The Oxford Handbook of Governance*. Oxford University Press: Oxford, UK. pp. 49–64. DOI: <https://doi.org/10.1093/oxfordhb/9780199560530.013.0004>
- [51] Filho, W.L., Wolf, F., Moncada, S., et al., 2022. Transformational adaptation as a sustainable response to climate change: insights from large-scale case studies. *Mitigation and Adaptation Strategies for Global Change*. 27(3), 20. DOI: <https://doi.org/10.1007/s11027-022-09997-2>
- [52] Kok, M., Metz, B., Verhagen, J., et al., 2008. Integrating development and climate policies: national and international benefits. *Climate Policy*. 8(2), 103–118. DOI: <https://doi.org/10.3763/cpol.2007.0436>
- [53] Mizuno, O., Okano, N., 2024. Reconsidering National Adaptation Plans (NAPs) as a Policy Framework under the UNFCCC. *Climate Policy*. 24(9), 1309–1321. DOI: <https://doi.org/10.1080/14693062.2024.2378194>
- [54] Morgan, E.A., Nalau, J., Mackey, B., 2019. Assessing the alignment of national-level adaptation plans to the Paris Agreement. *Environmental Science & Policy*. 93, 208–220. DOI: <https://doi.org/10.1016/j.envsci.2018.10.012>
- [55] Biagini, B., Miller, A., 2013. Engaging the private sector in adaptation to climate change in developing countries: importance, status, and challenges. *Climate and Development*. 5(3), 242–252. DOI: <https://doi.org/10.1080/17565529.2013.821053>
- [56] Cui, L., Huang, Y., 2018. Exploring the Schemes for Green Climate Fund Financing: International Lessons. *World Development*. 101, 173–187. DOI: <https://doi.org/10.1016/j.worlddev.2017.08.009>
- [57] Timilsina, G.R., 2021. Financing Climate Change Adaptation: International Initiatives. *Sustainability*. 13(12), 6515. DOI: <https://doi.org/10.3390/su13126515>
- [58] Viguri, S., López Tovar, S., Juárez Olvera, M., et al., 2021. Analysis of External Climate Finance Access and Implementation: CIF, FCPF, GCF and GEF Projects and Programs by the Inter-American Development Bank. *Inter-American Development Bank: Washington, DC, USA*. DOI: <https://doi.org/10.18235/0003008>
- [59] Tavares, A.O., Santos, P.P.D., 2014. Re-scaling risk governance using local appraisal and community involvement. *Journal of Risk Research*. 17(7), 923–949. DOI: <https://doi.org/10.1080/13669877.2013.822915>
- [60] Edelenbos, J., Van Schie, N., Gerrits, L., 2010. Organizing interfaces between government institutions and interactive governance. *Policy Sciences*. 43(1), 73–94. DOI: <https://doi.org/10.1007/s11077-009-9086-2>
- [61] Newig, J., Fritsch, O., 2009. Environmental governance: participatory, multi-level – and effective? *Environmental Policy and Governance*. 19(3), 197–214. DOI: <https://doi.org/10.1002/eet.509>
- [62] Visseren-Hamakers, I.J., 2015. Integrative environmental governance: enhancing governance in the era of synergies. *Current Opinion in Environmental Sustainability*. 14, 136–143. DOI: <https://doi.org/10.1016/j.cosust.2015.05.008>
- [63] Leck, H., Simon, D., 2013. Fostering Multiscalar Collaboration and Co-operation for Effective Governance of Climate Change Adaptation. *Urban Studies*. 50(6), 1221–1238. DOI: <https://doi.org/10.1177/0042098012461675>
- [64] Agarwal, A., Perrin, N., Chhatre, A., et al., 2012. Climate policy processes, local institutions, and adaptation actions: mechanisms of translation and influence. *WIREs Climate Change*. 3(6), 565–579. DOI: <https://doi.org/10.1002/wcc.193>
- [65] Majlingova, A., Kádár, T.S., 2025. From Risk to Resilience: Integrating Climate Adaptation and Disaster Reduction in the Pursuit of Sustainable Development. *Sustainability*. 17(12), 5447. DOI: <https://doi.org/10.3390/su17125447>
- [66] Rasul, G., Neupane, N., 2021. Improving Policy Coordination Across the Water, Energy, and Food, Sectors in South Asia: A Framework. *Frontiers in Sustainable Food Systems*. 5, 602475. DOI: <https://doi.org/10.3389/fsufs.2021.602475>
- [67] Flood, S., Paterson, S., O'Connor, E., et al., 2020. National Risk Assessment of Impacts of Climate Change: Bridging the Gap to Adaptation Action. *Environmental*

- Protection Agency: Washington, DC, USA.
- [68] Den Broeder, L., Uiters, E., Ten Have, W., et al., 2017. Community participation in Health Impact Assessment. A scoping review of the literature. *Environmental Impact Assessment Review*. 66, 33–42. DOI: <https://doi.org/10.1016/j.eiar.2017.06.004>
- [69] Seppey, M., Ridde, V., Touré, L., et al., 2017. Donor-funded project's sustainability assessment: a qualitative case study of a results-based financing pilot in Koulikoro region, Mali. *Globalization and Health*. 13(1), 86. DOI: <https://doi.org/10.1186/s12992-017-0307-8>
- [70] Wolf-Powers, L., 2010. Community Benefits Agreements and Local Government: A Review of Recent Evidence. *Journal of the American Planning Association*. 76(2), 141–159. DOI: <https://doi.org/10.1080/01944360903490923>
- [71] Aayog, N., 2017. Sustainable Development Goals (SDGs): Targets, CSS, Interventions, Nodal and Other Ministries. NITI Aayog, Government of India: New Delhi, India.
- [72] Fiack, D., Cumberbatch, J., Sutherland, M., et al., 2021. Sustainable adaptation: Social equity and local climate adaptation planning in U.S. cities. *Cities*. 115, 103235. DOI: <https://doi.org/10.1016/j.cities.2021.103235>
- [73] Sapkota, S., 2024. Sustainable Development Goals in Local Level Budget and Programs: A Critical Analysis in the Context of Nepal. *Prashasan: The Nepalese Journal of Public Administration*. 56(2), 88–100. DOI: <https://doi.org/10.3126/prashasan.v56i2.75334>
- [74] Dehnhardt, A., Grothmann, T., Wagner, J., 2022. Cost-benefit analysis: What limits its use in policy making and how to make it more usable? A case study on climate change adaptation in Germany. *Environmental Science & Policy*. 137, 53–60. DOI: <https://doi.org/10.1016/j.envsci.2022.08.005>