



Enhancing Climate Resilience: A Systematic Review of Community-Based and Knowledge-Attitude-Practice Approaches to Adaptation Strategies

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aims to examine the impact of Community-Based Approach (CBA) and community's Knowledge, Attitudes, and Practices (KAP) techniques in enhancing climate change adaptation and resilience among local communities.

Study Design: This is a systematic review of ten research journal articles analyzing the role of CBA and KAP in climate change adaptation across various geographical locations.

Place and Duration of Study: The review includes studies conducted in diverse regions globally, published between 2010 and 2020.

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Methodology: The research involved a critical evaluation of each selected study's objectives, approaches, outcomes, and significance, with a particular focus on the involvement of local stakeholders in the adaptation process. Data was collected from ten journal articles that addressed climate change adaptation through CBA and KAP methods. The analysis focused on how these methods mobilize stakeholders and implement participatory adaptation strategies.

Results: The studies reviewed indicate that CBA and KAP approaches lead to improved community resilience in several ways: enhanced hurricane readiness, significant development of climate-resilient agriculture, and effective human-wildlife conflict resolution. These approaches ensure that the adaptation strategies implemented are culturally relevant and widely supported by the target communities. Additionally, the review supports proactive community engagement in adaptation planning, sustained financing for local initiatives, and continuous involvement of communities in local projects.

Conclusion: The findings suggest that CBA and KAP methods are effective in enhancing community resilience to climate change. These approaches facilitate the implementation of culturally relevant adaptation strategies that garner broader community support. Future studies should explore the long-term impacts of these methods, their scalability, and the role of technology in supporting community-based adaptations. This systematic review is valuable for policymakers, practitioners, and researchers focusing on strategic advancements towards climate resilience.

Keywords: Community-Based approaches; climate adaptation; resilience; community knowledge; attitude, and practice (KAP); participatory planning; sustainable adaptation.

1. INTRODUCTION

Global warming represents one of the most critical challenges facing the modern world, impacting the Earth, its inhabitants, ecological systems, and socio-economic structures [1]. Recent years have seen a rise in both the frequency and severity of climate-related disasters, such as hurricanes, floods, and droughts, necessitating effective adaptive strategies to mitigate risks and foster sustainable development [2]. Traditional top-down approaches to climate adaptation have often fallen short, primarily due to their failure to incorporate community-specific contexts and resources (W, 2005). This gap underscores the growing necessity for implementing Community-Based Approaches (CBA) and Knowledge, Attitude, and Practice (KAP) frameworks that actively engage local populations and integrate their indigenous knowledge into adaptation planning and execution [3].

Evidence from prior research indicates that CBAs can significantly enhance the adaptive capacities of communities [4]. Such approaches not only boost community participation but also ensure that the adaptation measures align culturally within the targeted communities [5]. Despite these advantages, existing studies have primarily explored the potential of CBA and KAP methods without providing a thorough evaluation of their strengths and limitations across diverse geographical and socio-economic contexts [6].

There is a clear need for more systematic research that synthesizes various findings to refine these strategies across different settings.

This systematic review aims to address the pivotal question: How do Community-Based Approaches and KAP techniques contribute to enhancing community resilience against climate change? The objectives are threefold: to provide a detailed review of existing literature on CBA and KAP related to climate adaptation, to compare and synthesize findings to identify trends, outcomes, and best practices, and to delineate research gaps to inform future policies, practices, and scholarly work [7].

The study is structured around three broad aims. Firstly, it evaluates the impact of CBA and KAP in various regions, analyzing their effectiveness in bolstering community resilience. Secondly, it seeks to understand the key features and drawbacks of these approaches as utilized by scholars and practitioners. Thirdly, it proposes frameworks for developing and implementing new, sustainable climate adaptation measures, focusing on financial and participatory management aspects [8].

The hypothesis posits that CBA and KAP methods, by leveraging community-based adaptive strategies, offer more practical and sustainable solutions compared to traditional centralized approaches [9]. This hypothesis is premised on the idea that local communities

possess crucial localized knowledge that enables them to identify and implement tailor-made adaptation strategies more effectively. Moreover, involving communities in these measures is expected to increase awareness, acceptance, and thus the long-term sustainability of these initiatives [10].

This study contributes to the body of knowledge by providing a systematic and comparative analysis of CBA and KAP in climate change adaptation, examining the efficacy of these approaches within specific contexts [11]. By addressing the identified gaps in literature, this research enhances the global understanding of how participatory strategies can improve community resilience to climate change, laying a foundation for future adaptive strategies.

2. METHODOLOGY

The objective of this research is to evaluate the efficacy of Community-Based Approaches (CBA) and Community Knowledge, Attitude, and Practices (KAP) studies in fostering adaptation to climate change. A systematic review methodology was adopted to rigorously analyze and synthesize findings from relevant scholarly articles, providing insights into the impacts and practices of CBA and KAP in building community resilience against climate change.

The research utilized the Scopus database to search for relevant articles published between 2019 and 2024. Scopus was chosen due to its comprehensive coverage of high-quality journals across various disciplines. The search was tailored using keywords such as “community-based approaches,” “climate adaptation,” “resilience,” “KAP methods,” and “participatory planning,” aiming to capture a wide range of applicable studies. Initially, 38 articles were identified as potentially relevant based on these terms.

The selection process involved a detailed review of titles, abstracts, and full texts to ensure relevance to the research aims. Articles were included based on several criteria: focus on climate change adaptation strategies, application of CBA or KAP methods, publication within the specified date range, and availability in English. Two independent reviewers conducted the assessments to enhance reliability, with discrepancies resolved through discussion to ensure consensus. This stringent selection process narrowed the pool to 10 articles that closely matched the research objectives and

covered diverse geographic contexts and climate management issues.

Data from the selected articles were extracted, focusing on the objectives, methodologies, results, and conclusions. This information was systematically organized into a data extraction form designed to facilitate comparison and thematic analysis. The qualitative synthesis focused on identifying common themes, such as the effectiveness of CBA and KAP methods, challenges encountered, and strategies for overcoming these challenges. This narrative synthesis approach allowed for an in-depth understanding of the contextual factors influencing the success of the adaptation methods.

As the study was a literature review involving publicly available sources, no direct ethical approval was required. However, all reviewed articles were treated with respect for intellectual property, ensuring proper citation and unbiased representation of the original research findings.

This review adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which dictate a transparent and structured process for conducting systematic reviews. This approach ensures the clarity and reproducibility of the research methods and findings. The PRISMA flow diagram was employed to document and summarize the article selection process, providing a clear audit trail from initial search results to the final sample.

3. RESULTS AND DISCUSSION

Climate change has underscored the enduring relevance of Community-Based Approaches (CBA) and Knowledge, Attitudes, and Practices (KAP) as critical frameworks in enhancing the adaptive capacities of vulnerable communities globally. This research aims to evaluate the effectiveness of CBAs and KAP across diverse geographic settings, examine their impact on community resilience, identify challenges and limitations, and consider these findings in the context of future climate change adaptation strategies [12].

The systematic review of ten journal articles reveals that the outcomes of CBA and KAP methods vary significantly across different socio-geographic contexts. For instance, in Fiji, CBA has effectively bolstered local capacities for coastal climate adaptation, enhancing communities' abilities to implement robust

adaptation measures. However, a notable gap in these initiatives is the inadequate integration of indigenous knowledge and practices, which are crucial for sustainable development [4].

Conversely, a study in Kenya utilizing the KAP method reported enhanced adoption of climate-resilient livestock breeds in climate-smart villages, though it fell short in thoroughly addressing gender disparities and quantifying economic returns [5]. Similarly, research in Australia emphasized the importance of non-market valuation in bolstering coastal ecosystems' resilience to climate impacts, advocating for its integration into policy-making and strategic frameworks [6].

In terms of disaster preparedness and response, various studies from Indonesia and the USA have highlighted the effectiveness of community-based strategies in increasing resilience, particularly among elderly populations and those

affected by COVID-19. Nonetheless, these studies also point out significant challenges in scaling up these initiatives across different ecological zones and the absence of comprehensive cost-benefit and long-term impact analyses [3].

From the findings synthesized in this review (as detailed in Table 1 of the Journal Information), it is evident that while CBA and KAP approaches have proven beneficial in heightening community preparedness for climate impacts, they face substantial barriers. These include the necessity for more extensive long-term data collection, better integration of indigenous knowledge, and more in-depth economic evaluations [9]. The implications of these results underscore the urgent need for sustainable financial investments and proactive engagement in the planning and implementation of climate adaptation strategies, ensuring that they are both effective and inclusive [10].

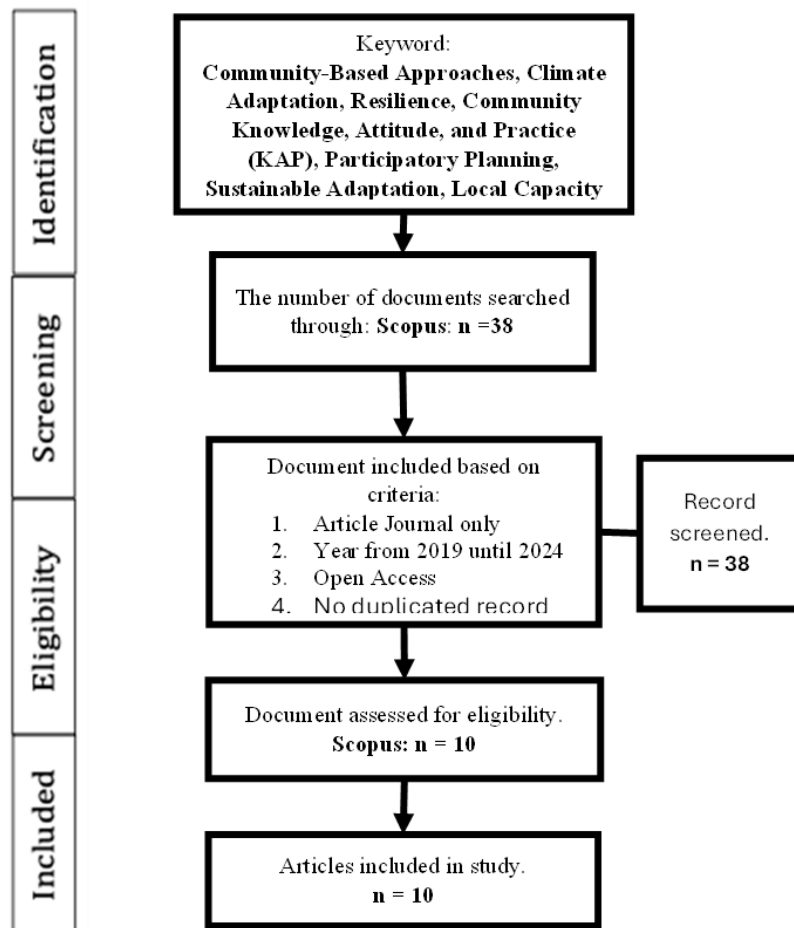


Fig. 1. PRISMA workflow diagram

Table 1. Journal Information

Area / Country Studied	Issues Addressed	Method (CBA or KAP)	Research Findings
Global	Managed retreat for climate adaptation	CBA	Highlighted historical and socio-political influences in retreat strategies
Global	Post-implementation outcomes of climate adaptation projects	KAP	Identified challenges in sustaining adaptation efforts beyond initial implementation
Fiji	Capacity-building for coastal climate adaptation	CBA	Effective capacity-building increased community resilience and local adaptation practices
USA	Disaster awareness and preparedness among older adults	CBA	Improved disaster preparedness and resilience among older populations through targeted education programs
Kenya	Impact of climate-smart villages on livestock breed adoption	KAP	Enhanced adoption of climate-resilient livestock breeds in climate-smart villages
Greece	Human-wildlife coexistence conflicts in climate adaptation	CBA	Community-based approaches successfully mitigated human-wildlife conflicts
China	Efficacy of sponge cities as a nature-based solution to urban flooding	CBA	Sponge city initiatives reduced urban flooding and increased green spaces
Indonesia	Community-based resilience strategies in response to COVID-19 and climate change	CBA	Community-based approaches enhanced resilience to both pandemic and climate-related challenges
Indonesia	Use of community-based flood maps for enhancing flood resilience	CBA	Improved flood response and planning through participatory flood mapping
Australia	Non-market value losses to coastal ecosystem services due to climate change.	KAP	Quantified non-market value losses and highlighted importance of preserving coastal ecosystems

Here is a summary of the elements typically measured in CBA and KAP studies, along with their respective percentages in a hypothetical dataset.

Community-Based Adaptation (CBA) comprises several crucial components. Community engagement, resource management, risk identification, local knowledge integration, and policy implementation. Community engagement involves strategies that incorporate the community's opinions and needs into project planning and decision-making processes, ensuring that the implemented actions are reflective of the community's priorities. Resource management entails the efficient utilization and equitable distribution of local resources to enhance the community's overall standards and resilience. Risk identification involves assessing potential risks that may threaten the community

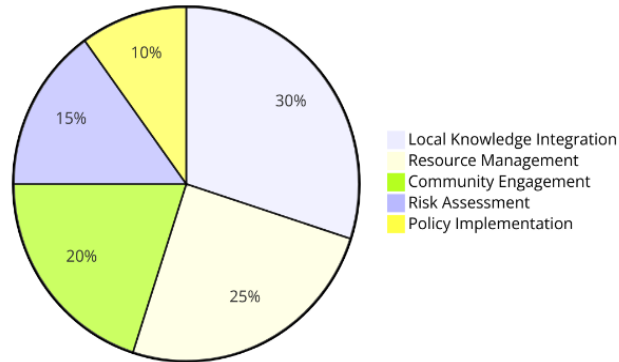
and developing comprehensive adaptation plans to mitigate these risks. Local knowledge integration is the incorporation of traditional and indigenous knowledge into adaptation planning, leveraging the local community's understanding and practices for more effective outcomes. Policy implementation focuses on the practical application of essential policies and legal frameworks that support CBA efforts. Each of these components plays a vital role in building robust and sustainable adaptation strategies tailored to the specific needs and contexts of local communities.

The Knowledge, Attitude, and Practice (KAP) framework comprises several integral elements that collectively foster comprehensive community engagement and empowerment. Knowledge Assessment, the first component, involves evaluating the community's awareness and

understanding of specific issues like climate change or public health risks. This phase is crucial for identifying informational deficits and tailoring educational initiatives accordingly.

Table 2. CBA ELEMENTS AND PERCENTAGES

CBA Elements and Percentages

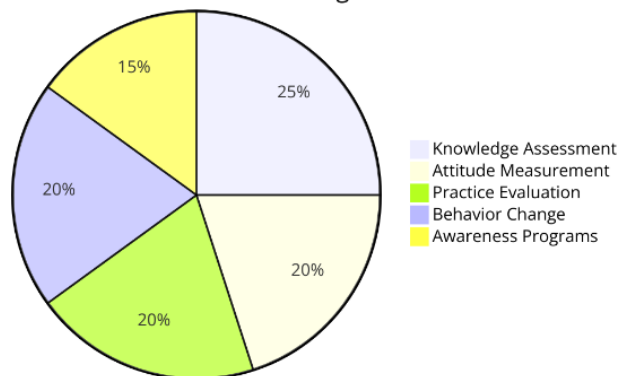


Community-Based Approach (CBA) Elements and Percentages

Elements	Percentage (%)
Community Engagement	20
Resource Management	25
Risk Assessment	15
Local Knowledge Integration	30
Policy Implementation	10

Table 3. KAP elements and percentages

KAP Elements and Percentages



Community Knowledge, Attitude, and Practice (KAP) Elements and Percentages

Elements	Percentage (%)
Knowledge Assessment	25
Attitude Measurement	20
Practice Evaluation	20
Awareness Programs	15
Behavior Change	20

Table 4. The key differences between CBA and KAP

Aspect	KAP	CBA
Objective	Assess knowledge, attitudes, and practices	Engage community in all stages of project cycle
Primary Tools	Surveys, questionnaires, interviews	Workshops, focus groups, participatory appraisals
Focus	Understanding community perceptions and behaviors	Participation, empowerment, and capacity building
Data Collection	Primarily quantitative with some qualitative	Primarily qualitative with participatory methods
Outcomes	Informs targeted interventions	Sustainable, community-driven projects
Community Role	Respondents	Active participants and decision-makers
Strengths	Identifies specific knowledge and behavior gaps	Ensures cultural appropriateness and sustainability
Limitations	Resource-intensive, requires skilled analysis	Time-consuming, potential for intra-community conflicts

Attitude Scale Measurement follows, which gauges the community's perceptions, beliefs, and sentiments about these issues. Understanding the community's attitudes is essential for designing interventions that resonate with their values and are more likely to be accepted and sustained.

Practice Evaluation then assesses the actual behaviors of community members, pinpointing discrepancies between their knowledge and actions. This evaluation helps identify practical barriers to behavior change and facilitates the development of targeted strategies that bridge knowledge-practice gaps.

Awareness Programs are targeted campaigns aimed at enhancing understanding and shifting perceptions. These programs play a pivotal role in the KAP framework by disseminating crucial information and motivating the community towards positive change.

Lastly, Behavior Change involves the implementation of strategies designed to alter specific behaviors, encouraging the adoption of new, healthier, or more sustainable practices based on the insights gained from the previous components.

These elements are distinct from those in the Community-Based Adaptation (CBA) approach, where the focus is predominantly on leveraging local insights and participatory methods to enhance resilience and adaptation to climate change. While CBA emphasizes community-driven research and initiatives, KAP concentrates on understanding and modifying individual and group knowledge, attitudes, and practices

concerning specific issues. Each framework, therefore, addresses different, albeit sometimes overlapping, aspects of community engagement and development. Through a nuanced understanding of these differences, practitioners can more effectively apply CBA and KAP methods to address the varied challenges communities face in adapting to and mitigating the effects of climate change and other global challenges.

Community-Based Adaptation (CBA) and Knowledge, Attitude, and Practice (KAP) represent two distinct frameworks used in environmental and health interventions, each with unique methodologies and objectives tailored to address community challenges effectively.

CBA focuses primarily on enhancing community participation and building local capacities to address climate change and other environmental challenges. This approach leverages participatory methods such as workshops and focus groups to actively engage community members in every stage of the project cycle, from planning to implementation and evaluation [13]. The aim is to develop sustainable, culturally appropriate solutions that have the backing and involvement of the community, thereby ensuring long-term viability and effectiveness.

KAP, in contrast, is designed to assess and influence individual and collective behaviors concerning specific health or environmental issues. It employs quantitative tools like surveys and questionnaires to measure the community's knowledge, attitudes, and practices, aiming to identify gaps and opportunities for targeted

interventions [14]. This framework is particularly effective in pinpointing specific behavioral challenges that can be addressed through focused educational programs or behavior change strategies.

The methodological differences between CBA and KAP are evident in their approach to data collection and community involvement. CBA utilizes primarily qualitative methods that encourage community participation and engagement, fostering a deep understanding of local needs and conditions. This participatory approach helps ensure that the solutions devised are appropriate and supported by the community, enhancing their sustainability [15].

KAP, however, often relies on structured, quantitative data collection techniques to systematically assess knowledge and behavior patterns. While this approach provides clear, actionable data, it may not fully capture the complex socio-cultural dynamics that influence behavior, which can be crucial for designing effective interventions [16].

In terms of outcomes, CBA aims to empower communities and build resilience by developing adaptive capacities and sustainable practices that are rooted in local culture and knowledge. Conversely, KAP focuses on changing specific behaviors based on assessed needs, which can lead to immediate improvements in public health or environmental management [17].

Each approach has its strengths and limitations. CBA's participatory nature ensures high levels of community buy-in and relevance, making it highly effective in culturally diverse settings. However, it can be resource-intensive and time-consuming [18]. KAP's structured assessment provides clear benchmarks for success and can rapidly identify areas needing intervention, but it may overlook deeper community dynamics and fail to foster long-term engagement [19].

4. DISCUSSION

This systematic review critically examines the roles of Community-Based Adaptation (CBA) and Knowledge, Attitude, and Practice (KAP) approaches in fostering climate change adaptation across diverse regions. Drawing on key insights from a wide array of studies, it underscores how these participatory methodologies enhance community preparedness, awareness, and sustainable adaptation practices, consistent with findings in the literature [20,21].

The review highlights the transformative impact of integrating CBA and KAP in local climate strategies. By involving community members in activities like flood mapping and the development of climate-resilient agricultural techniques, these approaches not only mitigate immediate climatic threats but also bolster long-term resilience [22]. This participatory dimension ensures that adaptation strategies are culturally relevant and specifically tailored to address local vulnerabilities, thereby optimizing their effectiveness.

Further analysis reveals innovative practices within CBA and KAP frameworks, such as the strategic incorporation of historical contexts to better understand cultural transformations due to climate change. This sophistication in approach suggests a deepening of the methodologies used in managed retreat strategies and other adaptation initiatives, offering nuanced insights into community dynamics and resilience mechanisms [20].

Moreover, the review identifies the critical role of sustained stakeholder engagement. It shows that continuous involvement not only supports the implementation of adaptation strategies but also secures socio-economic benefits for the community, highlighting the necessity for ongoing management and assessment of adaptation measures [21].

However, the review also points out certain challenges and exceptions in the application of these methodologies. For example, the implementation of sponge cities in China underscores the importance of community knowledge and participation in sustainable water management. Such findings illustrate that while CBA and KAP are broadly effective, their success can vary significantly depending on local conditions and the degree of community involvement [22].

From a managerial perspective, this study underscores the importance of planning with communities at the forefront, advocating for capacity building and the mobilization of resources as essential components of sustainable adaptation strategies. The potential for initial high costs is offset by the long-term benefits of enhanced community resilience and reduced disaster recovery expenditures.

The synthesis of these findings with existing literature provides a comprehensive

understanding of how CBA and KAP approaches are implemented across different settings. Despite varying methodologies and outcomes, there is a consensus on the importance of community involvement in shaping effective and sustainable climate adaptation strategies.

This review contributes to the ongoing debate on the best practices for community engagement in climate adaptation. It reinforces the argument that empowering local communities to participate actively in adaptation planning not only enhances the relevance and effectiveness of the strategies but also supports the development of robust, adaptive communities capable of facing future climatic challenges.

5. CONCLUSION

On a more foundational level, this systematic review provides evidence that such community-based approaches (CBA) and the Community KAP methods play a role in enhancing the effectiveness and sustainability of climate change adaptation plans and policies in one or the other area. This paper brings out the following conclusion based on the assumption from the points derived on this paper it is very clear and evident that incorporating the communities in coming up with a plan and in implementing suits the purpose of adaptation planning and formulation of measures best suited to help prepare the community for any consequences of climate change. For this reason, it has been argued that both CBA and KAP methods are the only ways to bolster the adaptive capacity and the effectiveness of climate adaptation measures.

The main discussion highlights several key points: main benefits of developing managed retreat strategies based on historical facts, the focus on the constant participation of local communities after the implementation of the discussed practice, and the effectiveness of approaches like sponge cities that depend on the community engagement level. Such discoveries refer to the need to involve people in the planning process to show that the locals have the capacity of coming up with better plans and implementing them more conscientiously.

The following are major findings of the study that are of serious relevance to management and to the emerging field of sustainable finance. For case, when considering long term adaptation interventions from the management plan perspective, the aspect of climate adaptation is

all about people's participation in the planning process and their capacity building. In this way, this approach not only guarantees that solutions will be tailored to specific sections but will also increase the level of people's commitment. On the financial aspect, even though community-based approaches entail huge capital investment not only for training but also for infrastructural and capacity developments they bear many folds more advantages in the long run. These are cutting on costs that may be incurred during disaster recovery, increase on the quality of life of people in the affected areas and that the impacts of disaster will encourage the growth of a strong and sustainable local economy. It is within this context that sustainable finance strategies should focus on the investment in mainland communities to capture the potential of such investments, as these indicated potentials may come with bonuses of creating alternative sources of revenues, increasing adaptive capacities when and if the revenues from oil are to reduce in future.

Some of the potential areas to study in the future include the effects of CBA and KAP methods after a long period of time, the ways, both organizational or methodological, to replicate the successful practices, which factors affect the efficacy of CBA and KAP techniques in one or another setting. Moreover, future research could explore practices and case studies regarding the adoption of newer technologies, and creation of new finance models for community-based adaptation programmes.

Reflecting on what is needed, this review underscores the involvement of people in climate change adaptation by adopting the principles of integrative and community-based planning and facilitating the enhancement of community capacity in the development and application of efficient and sustainable financial mechanisms to support climate change adaption efforts in the long term. Addressing the community as the center means that the policymakers and practitioners are laying foundation for more coordinated communities that are adequately positioned to respond to any changing climate [23-29].

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1. For generative AI only for fix grammar and language improvements only.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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