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Review

# Community-Based Adaptation to Climate Change: Core Issues and Implications for Practical Implementations

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**Abstract:** According to current forecasts, global heating is likely to exceed 2,8°C by the end of the century. This makes substantial adaptation measures necessary to secure a broad basis for livelihoods provision and the conservation of biodiversity. While the implementation of top-down and technocratic adaptation efforts is the majority, related adaptation shortcomings of socio-economic and ecological nature are becoming more and more apparent. Community-based adaptation (CBA) with its participatory, inclusive and needs-based bottom-up approach offers a promising and powerful alternative. This article uses a semi-systematic literature review approach to screen the current literature and identify core issues of CBA. Linking communality, locality, multidimensionality, power imbalances, transformative potential, localisation, the triad of adaptation metrics and adaptation with nature to corresponding potential actions for practical implementations provides a more holistic conceptualisation and broadens the horizons for further learnings, research and improved application.

**Keywords:** community-based adaptation; adaptation to climate change; semi-systematic literature review; approach; concept

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## 1. Introduction

The negative consequences of global heating are significant, especially in countries of the Global South. These will continue to increase in scale and accelerate in their appearance over time as the global average temperature is on its way to rise over 2,8°C in the coming decades. The ecological consequences include growing irregularities in rainfall patterns, more frequent droughts and intense storms, as well as a general sea level rise. This will affect agricultural production, health, living conditions and economic activities, while exacerbating existing and trigger new social tensions and conflicts [1], putting pressure on communities' productive capacities. The Intergovernmental Panel on Climate Change (IPCC) advocates for a holistic and integrated way of adaptation, to tackle the social, economic, and ecological factors surrounding the climate change challenge. In summary, the IPCC Working Group II (2022) points out that the "cumulative scientific evidence is unequivocal: climate change is a threat to human wellbeing and planetary health. Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all" [1]. The alarming reality is, that even if greenhouse gas emissions and deforestation, which are the main drivers of climate change, were stopped immediately, the inertia of the climate system would lead to continued global heating for decades to come [1], [2], [3], [4]. Therefore, adaptation to the negative effects is required today and it will be needed in growing extent in the future.

The past has shown that top-down and technocratic approaches, where decision making processes regarding adaptation solutions occur mostly from outside of the local community or through a few of its actors with decision making power, often fail to meet the needs of those affected and risk leading to social, economic, political, and ecological shortcomings [5], [6]. Depending on the context this may be for a variety of reasons. Often it is the epistemic and decision-making power of donors to dominate over key terms, such as how activities are defined as successful, which does in many cases do not reflect the goals of the various and different members of a community. In addition, there is frequent neglect of genuine integration of context-specific local knowledge as well as reluctance to involve those affected as equal partners, all of which endangers the sustainability of actions. A notable example of a failed top-down climate change adaptation project is the construction of dams in Bangladesh. The dams that intended to shield communities from cyclones and storm surges inadvertently created a false sense of security. This led to the development and building of infrastructure and housing in vulnerable areas. When extreme flooding occurred at a later point in time and it was swamping the dams, severe damage was inflicted and human lives were lost [7]. Similarly, the construction of seawalls in Kiribati/Oceania to combat rising sea levels exemplifies another failed top-down project. While the structures were designed to protect coastal regions, they ultimately caused severe erosion at other parts of the coastline, exacerbating the local communities' vulnerability [8]. A consequence of such experiences is the increasingly recognized understanding about the necessity to centre the approach of adaptation to climate change around the local requirements and needs of inhabitants of the concerned regions. The approach of Community-based Adaptation (CBA) to climate change conceptualises adaptation essentially as a social process originating in the needs, capabilities and values of the persons primarily concerned by a specific climate challenge [6], [9], [10]. Hence, the challenges are defined from the bottom-up [11] and actions are grassroot driven [12], while operating in a transdisciplinary manner [13] including as many persons of concern as possible and the various stakeholders in the process. CBA is conceptualised as an inclusive, participatory, deliberate, and holistic approach [13], [14].

An influential theoretical concept in the CBA literature as well as more widely in adaptation to climate change is the triad of adaptation metrics to measure success of the actions. It was initially introduced with the premise that adaptation is not only shaped by vulnerability and resilience but also by the capacities of persons of concern and their environments [1], [15]. *Resilience* refers to the mechanism of recovering, and bouncing back in the face of adversity, stress, or significant challenges to maintain or regain functionality and well-being. It is originally a concept from systems ecology applied to social forms. *Vulnerability* reduction refers to the process of decreasing the susceptibility to harm from adverse events by anticipating, coping with, resisting and recovering through proactive planning. Being vulnerable has a geographical, e.g. living near the equator, and a social component, e.g. being affected from the consequences of coloniality. *Adaptive capacity* is the ability to adjust to potential damage, take advantage of opportunities, and respond to changes or uncertainties effectively. It involves flexibility, learning, and the implementation of strategies to manage and cope with evolving threats and conditions. All components of the triad build an organic whole in the sense that they interact and overlap. They relate to individuals, communities and systems and are applied in a variety of fields such as psychology, sociology, economics, public health, environmental studies and agriculture.

Initial actions in adaptation to climate change stem from the discipline's disaster risk reduction [16], sustainable development, and (community-based) natural resource management [17]. Practical implementations of the approach were applied in rural regions of the Global South with an emphasis on the pacific islands [12], while urban projects [18], [19], [20], [21], [22], [23] and initiatives in the Global North [24], [25], [26] are less common. It encompasses a variety of activities in the fields of livelihood diversification, capacity building, resource management, microfinance, insurance, infrastructure and ecosystem integrity [27]. Ideally, a broad range of stakeholders are involved including donors, academic institutions, civil society organisations, government bodies, private companies, grass-root and community-based organisations, and most importantly the persons of concern [11], [28], [29]. The value of putting emphasis on social and community processes during the

implementation of adaptation actions have been illustrated in several publications, such as in the study of McNamara et al. [12], which shows that the evaluated projects primarily guided by the community were more impactful than others that were not. This was the case in the 'Yumi redi long klamet jenis' project on Tanna Island, Vanuatu which aimed at increasing awareness for climate change and gender issues and building capacities with an adaptation action plan, while implementing climate resilient agricultural and food security practices, solar food preservation and water resource management [13]. Another example is the bamboo construction project in the Philippines, in which community members were trained on climate resilient architecture with bamboo wood, through which skills were acquired to foster livelihood improvement on a longer term [30]. An CBA intervention can involve the setting up a community-based organisation (CBO) or working through the structures of an already existing community-based entity which has an allocative, control and representative function [29], [31], [32].

In the last ten years, twelve publications have been presented, which provide a review or overview of studies or evaluation of projects in CBA [6], [12], [14], [27], [33], [34], [35], [36], [37], [38], [39], [40]. They focus on achievements and challenges of this approach and suggest optimization points and success assessment features. In general, they show different ideas and pathways on how to improve the implementation of CBA.

Kirkby et al. [6] approached the complex nature of CBA through synthesising different challenges. A key issue addressed is the nuanced relationship between poverty and the metric of vulnerability, pointing out that poverty cannot be equated to vulnerability, complicating assessments and interventions. In addition, they emphasise on the overlaps between adaptation and development in multidimensional ways and the complication this means for funding and integration into development frameworks. The authors conclude that genuine participatory community engagement is challenging given existing power imbalances. Financing mechanisms often favour top-down approaches, highlighting the need for community-driven funding models and consideration of higher policy areas. Transdisciplinary collaboration is essential for CBA, as climate change affects many different areas of life and thus creates complex and multifaceted challenges. Therefore Kirkby et al. [6] advocate for comprehensive dialogue and understanding between different disciplines in applying CBA measures.

With a focus on evaluation reports from projects spanning from 2006 to 2016, Piggot-McKellar et al. [37] analyse practical implementation aspects of the approach. They investigate common barriers to successful CBA projects and show that in the works reviewed, socio-political challenges were the most prevalent (92%), followed by resource restrictions (84%), and difficulties concerning physical systems and processes (24%). Socio-political barriers encompass cognitive and behavioural issues, government structures and governance as well as power imbalances. Resource barriers include financing of the solutions, access to information and technology, human resources, time, and infrastructural challenges. The authors emphasise on the necessity of suitable, accessible and improved monitoring and evaluation of outcomes of CBA projects to be able to address and enhance the effectiveness, equity, and sustainability of interventions.

In an evaluation of community-based adaptation initiatives in the Pacific Islands, McNamara et al. [12] addressed the question of whether and to what extent activities implemented were appropriate, effective, equitable, sustainable and efficient. As a general result, their analyses showed that locally financed initiatives and those carried out by non-governmental organisations (NGOs) were most likely to reach the criteria of being community-based. Initiatives that focused on awareness raising of climate change and those which integrated ecosystem-based approaches performed well. Following this analysis, multidimensional and interdependent leverage points for future CBA initiatives were suggested to monitor during implementation: local consent and ownership rights, shared access to and benefits from initiatives, integration of local realities, and system-thinking and proactive long-term planning.

Shammin et al. [38] elucidate the challenges encountered while working with CBA based on a survey in several countries of the Global South. Often constraints arise because of limited building of relationships during project implementation due to a lack of time, insufficient access to information



and communication tools and poor infrastructure quality. The authors explain the significance of applying effective communication and information dissemination measures in CBA efforts, as well as the benefits of implementing multi-scalar interventions. The necessity of developing support for CBA across multiple scales to foster synergies between the surrounding infrastructure and the applied community-based solutions is underscored, aiming to bolster the requisite institutions, policies, and rules of engagement. It advocates for the integration of CBA into national development plans and highlights opportunities for CBA initiatives to address prevailing development challenges.

Shammin et al. [27] emphasize the innovative potential of community-based approaches in enhancing climate resilience. It underscores the need for integrated strategies that not only address climate change but also tackle socio-economic issues aligned with the UN Sustainable Development Goals. The authors argue for the importance of local initiatives and direct engagement with vulnerable populations, supported by various stakeholders including international agencies and local governments. The chapter aims to develop a comprehensive picture for community-based adaptation by synthesizing past approaches with contemporary developments in sustainability, resilience principles, and disaster risk reduction.

Naths' [39] systematic scoping review delves into the significance of Structured Decision-making (SDM) in the execution of CBA measures. The study identified a range of barriers in socio, political, cultural, economic, technological and infrastructural domains and explained their significance and dynamics at different stages of implementation that risk impeding the success of CBA initiatives. As in the other reviews, Nath [39] discusses barriers, challenges and hurdles, offering a deep look into decision-making processes and addressing power imbalances, communication shortcomings, deficiencies in knowledge transfer and infrastructure challenges.

Chusnia & Nugroho [40] examine the opportunities and challenges of CBA with a focus on interventions in Indonesia. The opportunities they identified in the addressed projects of CBA include "protecting local ecosystems, raising awareness, building resilience, fostering innovation, creating jobs, and accessing funding". The challenges include "limited community participation, government involvement, leadership hierarchy issues, regulatory gaps, weak monitoring and evaluation, program sustainability, and lack of facilities". They note that opportunities of the analysed applications in Indonesia were often connected to working in sustainable environments and addressing human development, while challenges dominated in community relations and program sustainability.

These current reviews and overviews of CBA provide valuable insights into practical challenges and reveal several areas where further critical research, elaboration and theoretical development is required. Particularly the reviews by Piggott-McKellar et al. [37] and Nath [39] focus on the categorisation of barriers, such as socio-political and resource related constraints, but the abstraction of these findings into a broader framework is pending. The barriers are not placed in larger systemic contexts interlinked with broader societal factors. A systematic analysis can support the development of a robust and equitable framework that is adaptable and applicable to several contextual circumstances depending on where and with which goals respective projects operate.

While the reviews and overviews highlight financial constraints and governance issues as barriers, they mostly do not respond to the underlying power dynamics and historical inequities. For instance, Shammin et al. [27], [38] and McNamara et al. [12] but also Kirkby et al. [6] emphasise on the importance of local engagement without exploring how genuine participation is constrained by systemic factors. The complexity of the environment in which climatic change and adaptation takes place is not comprehensively represented.

Furthermore, while some work has highlighted the barriers and difficulties of CBA initiatives, less effort has gone into crystallising the actions that have contributed to the effectiveness of measures and the conditions that facilitated these achievements. While McNamara et al. [12] highlight in the described projects some impactful activities, the regional focus does not yet allow a wider deployment of these findings. Further research is needed to use this knowledge also in implementations in other contexts.

Piggott-McKellar et al. [37] call for better monitoring and evaluation, but broader frameworks that enable and integrate adaptive learning processes are needed for continuous improvement and scalability. Clarity on what factors and processes should be tracked during projects and the measurement of outcome indicators that are useful for analysis enable further steps towards planned and thoughtful monitoring and evaluation efforts.

Lastly, forward-looking perspectives that anticipate future challenges and opportunities in CBA are limited in the reviews and overviews described. While Shammin et al. [38] and McNamara et al. [12] advocate for long-term planning, there is great need to explore the impacts of emerging technologies, possible future socio-political changes, and evolving climate conditions. Here too, the formulation of a conceptual framework will facilitate further analysis to be able to specify which aspects and factors will be influenced by future conditions and technologies.

In summary, the inputs of the twelve reviews and overviews bring out valuable insights around the concept and the process of CBA today. At the same time, a consolidation of the current state of findings leading to core issues and related possible actions for practical implementations are lacking, calling for a deeper theoretical abstraction. The aim of this article is to contribute to this goal by building on the above work that serves as a transition to the analysis. In seeking to uncover core issues of CBA in the current literature and to discuss their theoretical nature and implications for practical work, the guiding research questions are:

Which core issues in CBA can be identified and consolidated in the available relevant scientific contributions? What potential measures and actions can be derived from these to address the core issues and apply them in practical implementations?

## 2. Materials and Methods

The screening for available and relevant scientific contributions is approached by a semi-systematic review procedure. This type of literature review combines aspects of systematic and traditional narrative review methods [41]. A semi-systematic literature review methodology is chosen for this study to identify core issues from the literature discourse and facilitate a deeper narrative review of contributions. This approach allows for the consolidation of diverse studies across multiple disciplines and successful practices and serves as a robust foundation for informed decision-making, while research gaps are revealed, and context-specific insights are considered. A predefined set of inclusion and exclusion criteria was used to select relevant studies, while some degree of flexibility and exploration in the search process could be integrated, such as using multiple databases, academic and grey literature, as well as varying search terms to amplify the diversity of possible results. Qualitative strategies such as summarising and synthesising the findings from studies in a narrative form served to identify patterns, themes and gaps in a first step. In a second step, the findings from the systematic review and from the narrative review were combined to lay the foundation for the emergence of CBA core issues, outlining content and process for implementation in practice.

Three academic search engines were used to screen scientific and grey literature from 2013 until 2024: at first, the Machine Learning Platform Research Rabbit via Schematic Scholars, which produced 135 connected papers and citations based on Kirkby et al. [6]. Second, the search string of 'community-based adaptation', which yielded 96 results in the database Scopus. Third, the same search string was used with Google Scholar yielding 8900 results, widening the screening in context and ensuring that no topic-wise relevant articles were left out. The use of three search engines broadened the sources and the results, which reduced the risk of missing relevant contributions. The search was guided by the content criteria that the mere mentioning of CBA did not lead to the inclusion of a piece, but the article had to contain a discussion of any kind of conceptual aspects or portrayed substantial content about its implementation. The articles needed to be centred around CBA rather than using the term as an example, an outlook or a background information. This was ensured by only taking articles into account with the wording of "community-based adaptation" in its title as well as content or implementation descriptions in its abstract. Excluded were in addition

those articles that ignored the challenge of climate change. After consolidation and eliminating redundancies, 91 articles emerged from the review process.

### 3. Results

The analysis of the selected 91 articles yielded recurring themes and reflections, from which eight core issues were identified: communality, locality, multidimensionality, power imbalances, transformative potential, localisation, triad of adaptation metrics and nature-based adaptation.

In the following, the core issues are described as they emerge from the literature. Several associated process activities, that facilitate the implementation of a core issue in project work, are then outlined in tabular form.

The issue of “*Communality*” aspires to go beyond viewing the community purely as a geo-culturally bound, homogenous, static, or monolithic group of equals. Quite the opposite, communities are for the most part fluid, heterogeneous and complex and are described as spatiotemporal contingent [42], as outcomes of a complex network of power relations [43], operating on a socio-political landscape [6] or as multi-faceted entity along the lines of a multitude of socially constructed identities [13]. Treating a community as a fixed unit, bears the risk of ignoring differences regarding various aspects, while it is especially the recognition and action response to those differences that are crucial for project success [12], [44], [45]. A self-definition endorsed by the community is key to local ownership and leads to less potential for conflict in the distribution of benefits and burdens [12]. Soeters [46] proposes as a “de-territorialising” intervention, to start not from communities as a notion but from the existing natural resources to which people relate.

A second recurring core issue is the “*Locality*” of an adaptation action. This means that CBA measures address local problems by and through the participation of local people, and are therefore place-based, context-specific and embedded into a culture [18], [33], [35], [42], [47]. Nevertheless, integration into broader policy agendas and programs provide legitimacy, financial and material support and a long-term perspective [24], [48], [49], [50], [51], [52]. CBA interventions are often unsuccessful due to challenges connected to the issue of locality, such as the appropriation of the measure by external actors with decision making power and a lack of a participatory approach [32], [33], [36], [40], [48], [53]. Social and political-economic structures are sometimes hindering interventions when national land tenure reforms or trans-municipal infrastructure projects are required. These are measures over which a majority of the concerned community has often no direct influence and which are therefore difficult to address as part of an intervention. This underlines the importance of embedding projects in broader or multiscale governance structures [34], [48]. Solely state-led intervention on the other hand risk to increase social vulnerability [36].

Another core issue mentioned in the literature is the “*Multidimensional*” character of CBA, which implies that the problem of climate change and the adaptation measures that respond to it have multiple facets. They are not independent and detached challenges that are unaffected by the wider socio-economic, environmental or development space [12], [37], [38], [42], [54]. This is reflected in the work of Galvin [55] and Velempi [56], who view CBA as historical or political, as well as by Kirkby et al. [6], Clarke et al. [13], Hung [57], and Phong [58] who describe, propose or use it as transdisciplinary. McNamara & Buggy [14], emphasise its multisectoral potential and Clarke et al. [13], Forsyth [33], Reid & Schipper [59], Mfitumukiza et al. [60] and Galvin [55] stress its holistic nature. Thus, global heating and its consequences cannot be reduced to its physical component alone but need to be understood in its political and social dimensions and the same is implied for the response - the adaptation actions.

A fourth core issue that emerged in the literature screening are the existing inter-, intra- and trans-group “*Power imbalances*”, whether within one community, between neighbouring communities, or between the community on a local scale as well as structures and institutions on a national or global scale [6], [14], [37], [40], [61]. This concern is also referred to as socio-political and socio-economic structures as the root causes of vulnerability [14], [27], [54], [60], [62]. Sometimes this is framed positively as equity [12], which bears the risk of excluding less powerful groups in decision making for an adaptation measure when the selection of actors take place. The literature points out

that ignoring the existence of these power imbalances can hinder adaptation efforts and success [14], [37], [39], [47]. While by addressing them, for example through equal access to and community ownership of resources and land [63], [64], [65], [66], [67] or through the deliberate inclusion of certain interest groups in the decision-making processes of governance and financing systems, effective adaptation action is facilitated [68], [69], [70], [71]. Diversity in power-sharing is emphasised along the lines of socially constructed identities [34], [53] of gender [13], [66], [72], [73], [74], [75], class [64], race [76], ethnicity [34], age [77] and religion [75]. To overcome existing social inequalities, epistemic injustices and psychological mechanisms of coloniality and oppression are to be respected and addressed [56], [78], [79], [80], [81], [82].

The literature repeatedly points out that CBA has inherent "*transformative potential*" and that by altering the way in which nature is treated, changes also can take place in various other areas of the persons' lives. As it is also about - but not limited to - reducing or positively reshaping existing power imbalances, it can be seen as a counterweight to the issue of power inequality [21], [83], [84], [85]. Dodman & Milting [48] have argued for transformation by addressing higher political levels, while Ensor [83] states that "[...] seeing communities embedded in linked social-ecological systems means that transformation will need to account for ecological as well as socio-political sustainability. Integration of these themes - of equity, economy and ecology - is at the heart of the challenge of transformation and CBA." This connection can be further traced in the literature in Galvin's [55] work, who defined CBA as a change agent, Nath [84], who conceptualised and framed it as a transformative community-based action and Selje [85], treating it as a tool for socio-ecological transformation.

The discussion of power imbalances led to a more nuanced view of various concepts such as that of "community" which is now interpreted in a much more differentiated way. This also occurred in relation to the "*Triad of Adaptation*", consisting of resilience, vulnerability and adaptive capacity. Resilience is a concept that originates from systems ecology and has been applied to social phenomena [86]. It means "jumping back" to the status quo, a state that is sometimes neither desirable nor existent and can therefore hinder transformation [87]. Vulnerability is often seen as a "natural" or geographical characteristic based on place of residence or origin. This is neglecting that being vulnerable has in addition a socially constructed and historically evolved side, e.g. through colonialism [42], [56]. Adaptive capacity is mostly connoted positively in the CBA literature [88], [89]. It refers to the ability of individuals or groups to intentionally create or influence changes in response to, or in anticipation of, external disruptions [88], [89]. The work of Ensor et al. [61], Archer et al. [18], Clarke et al. [13] and Beckwith [68] are starting points for discussing resilience in CBA in general. While the works of Dodman & Miltin [48], Lasagne et al. [90], Kirkby et al. [6], Roy et al. [91], Roy [92], Bardosh [93] and Hsieh & Lee [94] are specific examples mentioning the social side of vulnerability. The critique of metrics can be addressed if CBA researchers and practitioners introduce new and more community-oriented aspects [12], [95], [96].

Another increasingly prominent core issue is "*Localization*", emerging from a movement in the global South that grew out of the experience of various shortcomings of previous adaptation actions, such as insufficient inclusion in decision-making processes and a lack of funding systems for local initiatives. It appeared frequently in the literature from the early 2020s onwards through the work of Chung [43], Mfitumukiza et al. [60], Westoby et al. [76], Masud-All-Kamal & Nurse-Bray [45], [97] or Roy et al. [91] and was linked to CBA conceptually by Vincent [98]. The notion of locally-led action emphasises ownership by those affected and their ability to engage in international policy arenas [98], [99]. It is constructed to explicitly address the 'local' in relation to different levels from the grassroots to the national and international, thereby involving a broader range of actors. This focus attempts to address the challenge that CBA has often been influenced in practical implementations by external agendas and thus diverged from local priorities [98], [99]. By taking the dimension of localization to the forefront, the approach seeks to emphasise the importance of community ownership. CBA is a localised response through risk perception to environmental change [61], [100], [101]. It includes local leadership [19], [56], [102] or decentralisation [103], while some authors argue



that depending on the context and the climate challenge to address, there has to be a balance between external efforts and communities’ own inputs [104].

The final core theme identified, “*Nature-based Adaptation*”, refers to design projects around an ecosystem - this can be either a new or the revitalization of a degraded ecosystem. In addition to the ecological benefits, such as increased biodiversity and health, an ecosystem provides a material anchor point. This can encourage local people to identify with the project and also provide material benefits for the surrounding communities, for example by serving as a source of food supply and as a social meeting point or place of culture to foster an overall ecological way of life [12], [40], [46], [53], [105], [106], [107], [108]. Adapting to nature in CBA has been a common approach from its beginnings [9], [10], [109]. Many scholars and practitioners emphasised the synergies between CBA and ecosystem-based adaptation [110], [111], [112], [113], [114], [115], [116]. Reid [117] pushes a focus of CBA on the natural to the forefront, Dhar & Khirfan [118] call for an ecological design, while Shammin et al. [27] cite ecosystem integrity as a key theme for their framework. Several case studies provided examples of community-organised nature-based solutions such as the cultivation of mangroves [113], [119] or various actions in agriculture in traditional [51], [120], [121], [122] or climate smart ways [123], [124], [125] as well as agroecology [105], [123], [126], ecosystem conservation [120] and agroforestry [123], [127], [128], [129].

The above-mentioned eight core issues emerged as the most frequently and prominently discussed ones in the screened literature. It is to be assumed that this current discourse views those as essentially defining the approach of CBA. With that said, how can these more theoretical perspectives and discourses be considered in and translated into practical applications? Table 1 below includes the eight core issues, substantiates each one of them by providing additional specifications on their contents and related implications for implementations.

**Table 1.** Core issues of CBA and implications for practical implementations.

Core Issue	Content and implications
Communality	- <b>Inclusive Involvement:</b> Involve different ethnic, religious and socio-economic groups as well as different stakeholders out of the community in the whole project cycle from problem definition, prioritisation, project activity design, implementation, monitoring and evaluation, continuation beyond project timeframe
	- <b>Strong Community Networks:</b> Facilitate the formation of new and strengthening of existing local community groups to foster collective action and exchange
	- <b>Needs-based Community Formation:</b> Ensure the community forms around a common problem and need
	- <b>Problem-Driven Activities:</b> Base activities on problem and needs definitions of the community
Locality	- <b>Local Problem Definition:</b> Ground the problem definition on place-based and context-specific information
	- <b>Local Activity Design:</b> Adjust activity design to local regulations and policies

	<div><div></div><div><ul style="list-style-type: none"><li>- <b>Multi-Level Coordination:</b> Coordinate activities across various levels and scales with authority focal persons</li><li>- <b>Government - Community Bridge:</b> Facilitate continuous dialogue between government representatives and several stakeholders of the community at the intervention site and at the various levels</li><li>- <b>Local Movement Strengthening:</b> Partner with other communities and social movements to address higher policy arenas</li></ul></div></div>
Multidimensionality	<div><div></div><div><ul style="list-style-type: none"><li>- <b>Integrated Activities:</b> Identify next to the physical in addition the socio-political and cultural dimensions of the local adaptation challenge and integrate related issues in cross-cutting actions</li><li>- <b>Embedded Knowledge Systems:</b> Review feminist and indigenous knowledge through participatory action research and address it in long-term trust building processes</li><li>- <b>Multi - Sectoral Response:</b> Design multi-lateral and multi-sectoral actions with engagement and collaboration of various stakeholders</li><li>- <b>Historical Context:</b> Address political and historical contexts during problem definition and activity design, emphasising aspects of climate justice and colonialism</li></ul></div></div>
Power Imbalances	<div><div></div><div><ul style="list-style-type: none"><li>- <b>Existing Power Dynamics:</b> Assess distribution of power in the community, bring power imbalances to light, discuss possibilities in rebalancing power and integrate appropriate measures into activities</li><li>- <b>Resource Distribution:</b> Support equitable access to and distribution of financial and material resources</li><li>- <b>Inclusive Decision Making:</b> Ensure the decision-making participation of vulnerable and marginalised groups</li><li>- <b>Capacity building:</b> Provide a platform for social learning and action to foster empowerment and inclusive governance advocacy</li></ul></div></div>

Transformative Potential	<ul style="list-style-type: none"><li>- <b>Transformative Activity Design:</b> During co-design with the community integrate aspects of other life areas to be reshaped during the implementation of CBA actions</li><li>- <b>Long-Term Pathways:</b> Map out long-term pathways for activity continuation including needed resources for long-term uptake</li><li>- <b>Participatory Actions Research throughout implementation:</b> Use reflexivity and participatory action research to discuss problems and activities in recurring cycles for continuous tailoring of the activities to the needs and to facilitate transformations</li><li>- <b>Innovative Solutions Selection:</b> Prioritise and experiment with transformative and innovative solutions</li></ul>
Localisation	<ul style="list-style-type: none"><li>- <b>Analyse and Address Criticism:</b> Acknowledge criticisms and shortcomings of previous CBA actions and analyse its causes and how to address these in future projects</li><li>- <b>Local Expertise:</b> Integrate and base activity design on expertise and experiences from local persons and stakeholders</li><li>- <b>Local Leadership:</b> Balance leadership and responsibilities as per the local skills, resources, expertise and experiences to focus on local leadership where possible</li></ul>
Triad of Adaptation Metrics	<ul style="list-style-type: none"><li>- <b>Root Cause Analysis:</b> Consider several aspects of vulnerability (e.g. place based, social, historical) and identify and discuss its root causes</li><li>- <b>Community-based Metrics:</b> Co-develop success metrics with the community, how to respond to the identified vulnerability factors and how to foster the community’s adaptive capacity</li><li>- <b>Strengthening adaptive capacity:</b> Capacity building and planning of adaptive responses and how to effectively mobilize different assets to affect change</li></ul>

	<ul style="list-style-type: none"><li>- <b>Everyday Practice Reflection:</b> Revisit and reassess metrics through participatory monitoring and evaluation in cycles along the project implementation</li></ul>
Nature-based Adaptation	<ul style="list-style-type: none"><li>- <b>Ecosystem Needs:</b> Assess community exchanges with the ecosystem and align needs and resources for long-term sustainable exchanges</li><li>- <b>Cultural Integration:</b> Discuss the ecosystem’s place and provisioning as well as cultural value and how this can be reflected in activities</li><li>- <b>Cross-Field Learning:</b> Draw from concerned disciplines dealing with nature-based adaptation, i.e. ecology, environmental science, geography and sociology</li><li>- <b>Marginalised Reliance:</b> Work out ecosystem dependency of various community groups, acknowledge variation and integrate ecosystem provisioning accordingly in the project</li></ul>

4. Discussion

This manuscript provides a semi-systematic review of the current literature on CBA from 2013 until today, identifying core issues by screening the scientific and grey literature contributions and synthesising insights from various sources. The review focuses on understanding the multifaceted field of CBA and brings out core issues from the current literature, leading to the issues of communality, locality, multidimensionality, power imbalances, transformative potential, localisation, triad of adaptation metrics and nature-based adaptation.

These core issues are interlinked in various ways, some of which have evolved through engagement with other core issues in project activities or their importance has been demonstrated through various learnings. Thus, this has been a dynamic process from the beginning of the formulation of the CBA approach to the present day, although there is still further crystallisation and refinement of the theoretical definitions and related practical actions outstanding. Jarillo&Barnett [42] e.g. point out in their introduction that communality, locality, and multidimensionality present current tension fields to consider. Recently, the identified core issue of locally-led action gained more prominence and it was also echoed by the last two CBA Conferences where practitioners gather, share insights and discuss annually. Speakers at the conferences highlighted as well the importance of nature-based solutions and other themes connected to several of the core issues, e.g. integrating indigenous ways of living and intersectional lenses which resonate with power imbalances and transformation.

The recognition of the eight core themes has the potential to contribute comprehensively to target the critical gaps identified in the twelve reviews and working towards closing these gaps. In this way, they can help to guide on how to proceed in overcoming barriers of CBA projects which were mentioned in those reviews: reducing historical inequalities and addressing power dynamics,



promoting the effectiveness of interventions, developing robust monitoring and evaluation processes and tools, and anticipating challenges and opportunities that may arise in the future.

Barriers are tackled through working in projects with core issues like communality, localisation, power imbalances and locality. This includes socio-political challenges like lack of agency and hindering oppressive social structures, the integration of different and changing needs and desires of fluid communities, lacking resources and capacities at the local level and appropriation or neglect from higher government or policy areas. Considering the core issues and the associated ways of acting may mitigate some of these barriers for more effective CBA actions.

In addressing power dynamics and historical inequalities, the core issues of power imbalances, localisation, multidimensionality and transformative potential play a crucial role. They recognize that power imbalances work on the micro, meso and macro level, give CBA interventions an historical spin, a justice claim and open the way for a more holistic perspective.

To have CBA projects and measures be effective and reach their goals and objectives is supported by core issues such as locality, localisation, multidimensionality, adaptation with nature, and the triad of adaptation metrics. This emphasises that CBA interventions work best when they are supported by the local and non-local level alike, integrate several measures beyond a narrow climate-focus such as well-being and livelihood improvement, and argue for a community-driven approach on the definition of what “effectivity” means in the first place. Further, it emphasises that an adaptation with nature has significant co-benefits on multiple levels prioritising these for effective interventions. By changing the target coordinates of projects and measures – from economic amortisation and profit maximisation to individual empowerment and towards well-being, sufficiency and collective emancipation – the transformative potential is fed.

Robust Monitoring and Evaluation frameworks can be supported through the development of clearly defined indicators based on the core issues definition and its subordinated actions steps.

Finally, the anticipation of future challenges and opportunities is addressed through the core issues of transformative potential, multidimensionality, triad of adaptation metrics and adaptation with nature. These involve forward-looking strategies that consider the complex interplay of various factors affecting adaptation on the macro, meso, and micro level like political instability, economic crisis, ecological collapse, social unrest, or cultural conflict. CBA interventions can anticipate these dynamics and how to effectively mobilize different social, physical and economical components to transform structures.

The core issues identified from the literature have been repeatedly described in vague terms, lacking concrete definitions and practical guidance. This vagueness necessitates further specification and deeper exploration to enhance their applicability and effectiveness in real-world contexts and to be able to learn consciously from experience. The orientation on the core issues and its subordinates presented in this manuscript represent a novel course of action and an up-to-date basis. While using this at the project activity design stage and during implementations experiences made can be the basis for further research, aiming to further sharpening of the core issues.

Finally, since power relations and structures determine realities and are a major topic of discussion between CBA practitioners and theorists, it seems pertinent to point out that this article project is no exception in line with feminist and indigenous critiques of positivist science of the Global North [130], [131], [132]. The authors identify as two cis-male and a cis-female, are white, born in the Global North and had an academic education. This needs to be considered when interacting with the current article. The thoughts and experiences of a wider group will show which additions and perspectives need to be integrated to move further towards a comprehensive framework and practical applications will provide valuable learnings.

In conclusion, this manuscript offers an initial and holistic consolidation of core issues in CBA. While further refinement and practical inputs are needed, they can serve as a foundation for improving CBA implementation and informing future research. Addressing these core issues with greater specificity has the potential to enhance the validity and impact of CBA efforts.

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