

Analysis of Opportunities and Challenges of Community-based Adaptation as an Action to Combat Climate Change

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Abstract. According to the Asian Development Bank, Indonesia is the world's third most climate-risk country in 2021. Indonesia was identified as a country highly exposed to climate change impacts, including floods and extreme temperatures. Community-based adaptation (CbA) is an emerging concept in climate change management policies, both governmental and private. CbA provides adaptation to climate change by combining local knowledge, conditions, and community needs. Therefore, each CbA implementation has its opportunities and challenges. This study aims to understand the opportunities and challenges of CbA through implemented examples in Indonesia and other countries. The method used in this study is the literature review method. The results show that CbA can potentially create a climate-resilient society. However, there are also some challenges such as conflicts of interest and expensive financing. Studies on the effectiveness of CbA are needed to achieve better results in climate change adaptation in the future.

Keywords: Climate change; community-based adaptation, community needs; local conditions; local knowledge

1 Introduction

Climate Change is one of the global problems faced by all countries in the world. The International Panel on Climate Change (IPCC) defines climate change as a change in climate conditions identified from average changes and climate variability that lasts over a long period of time. Increased concentrations of greenhouse gas emissions, such as carbon dioxide (CO₂), nitrogen monoxide (NO), and methane (CH₄), are driving climate change [1]. Anthropogenic activities are currently a very significant activity to accelerate climate change. Anthropogenic activities in the form of industrialization and deforestation significantly increase global warming so that the impact of climate change is more intensely felt [2]. Climate change can have a very broad impact and affect all aspects of life. Some of these impacts include environmental degradation, increasing hydrometeorological disasters, sea level rise,

decreasing biodiversity, increasing health risks, and threatening the socio-economic life of the community. If climate change is left unchecked, the viability of life in the future needs to be questioned.

Countries with marginalized groups, such as the poor, elderly, and low-educated population, have a higher tendency to be exposed to the negative impacts of climate change. Areas with coastal features are included as areas most vulnerable to the effects of climate change. Indonesia as an archipelagic country that has a large coastal area coverage is identified as the third largest climate-risk country in the world [3]. In fact, around 150 million people or equivalent to 60% of Indonesia's population live in coastal areas [4]. In global coverage, it is noted that around 59.4% of the global population lives in coastal areas [5]. In addition to coastal areas, parts of the earth with other geomorphological features are also slowly being exposed to the negative effects of climate change. For example, almost all regions of the world with high or low altitudes experience a tendency to increase in temperature and shifts in climate variability. The World Meteorological Organization (WMO) even suggests that heat waves that currently occur in many parts of the world are one of the deadliest natural hazards [6]. Based on this, all regions of the world need to be vigilant in dealing with the impact of climate change. Adaptation to climate change is a very essential action that needs to be done.

Adaptation can be interpreted as an adjustment action in natural or human systems that reduces hazards in response to actual or predicted climatic conditions stimuli or impacts [7]. Various types of adaptation actions can be taken to minimize the effects of climate change. Community-based adaptation (CBA) is one type of adaptation to climate change that is widely implemented in various parts of the world. The term community-based adaptation (CBA) promoted by Huq and Reid, is an adaptation action with the principle of small-scale communities and bottom-up approaches in tackling climate change [8]. By focusing on local scales, CBA offers adaptation opportunities to better consider and integrate local knowledge, priorities, capabilities, and community contexts in addressing climate change impacts at the local level [9]. United Nations for Environmental Program (UNEP) actively develops CBA implementation to reduce the impact of climate change on society. It was noted that in 2010 there were 50-60 CBA programs and grew in 2012 to 80-120 CBA programs. This shows that the CBA framework is one of the trusted and widely chosen alternatives in tackling climate change.

Creating effective and sustainable CBA implementation may not be easy. Community integration as the main actor in CBA implementation is challenging. If the implementation of CBA is successful, the benefits felt by the community will be enormous. These benefits can not only be felt in the present, but may also be felt by future generations. However, if CBA implementation fails, negative impacts that can increase community vulnerability to climate change may also emerge [10]. Based on this, an understanding of implementation opportunities and challenges needs to be known. Each CBA implementation may have different opportunities and challenges. Understanding each other's implementation can be a reference for better CBA implementation in the future. Therefore, this research was conducted with the main aim to understand the opportunities and challenges of CBA through CBA programs that have been implemented in Indonesia and outside Indonesia. It is hoped that this study can provide new perspectives that support better CBA implementation so that the dangers of climate change can be minimized.

2 Method

This research used a systematic literature review approach to the literature on community-based adaptation. This was followed by a qualitative analysis of the content of each research publication that accumulated. This analysis will summarize into a descriptive analysis according to the researcher's needs based on the findings in each piece of literature obtained [11]. This type of analysis allows classifications to be constructed to identify conditions for implementing community-based adaptation in different countries, and then compared with Indonesia. This includes the opportunities and challenges that are faced in the two regions of comparison.

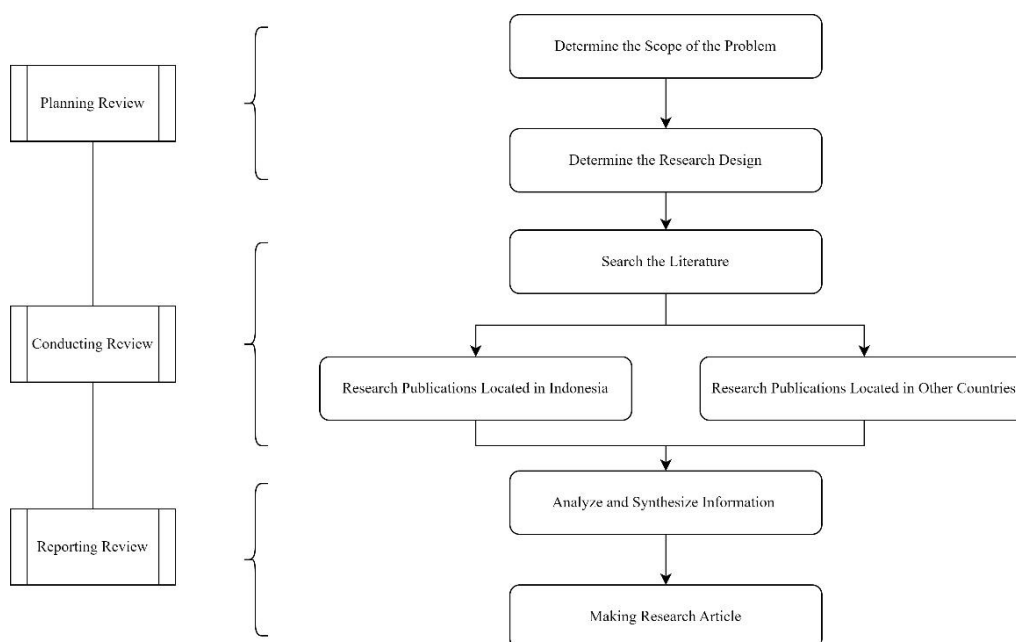


Fig. 1. Literature Review Synthesis Diagram

Based on the Literature Review Synthesis diagram above, it is known that this research is divided into three stages, in the form of planning, conducting, and reporting. The most important part of the process is determining the problem and design of the research to be carried out. In the second process, a literature search will be carried out as a data source. This literature is a research publication related to Community-based Adaptation (CBA) in various regions in the world and Indonesia. It aims to compare the conditions for CBA implementation based on "Challenges" and "Opportunities". This information will be used to draw research synthesis conclusions and will be discussed in the research article.

3 Result and Discussion

The results of the study show that each CBA implementation can have different opportunities and challenges. There is a tendency that the location of CBA affects the

opportunities and challenges that arise. This is in accordance with a study in the Organisation for Economic Co-Operation and Development (OECD) which suggests that policy venue which refers to the location of the implementation of a policy is related to the implementing actors of policy [12]. Each place has different decision-making tendencies because participants and policymakers have different characteristics. Based on this, different locations of same policy or program implementation can have different implications. Identification of differences in CBA opportunities and challenges found in the literature reviewed in this study is listed in Table 1. Generally, more CBA challenges were found than CBA opportunities. Based on the identification in Table 1, it can be seen that each CBA implementation has a specific emphasis on opportunities and challenges.

Table 1. Challenges and Opportunity of Community-Based Adaptation (CBA) in Each Literature

Literature	Opportunity	Challenges
An assessment of community-based adaptation initiatives in the Pacific Islands (2020)	<ul style="list-style-type: none"> Increased abilities of community members to interpret experienced changes, so that can support disaster preparedness and enhancing perceived capacities to cope. Integrated approach that focused on community scale also based on the protection of local ecosystem, it overlaps with ecosystem-based adaptation. 	<ul style="list-style-type: none"> Poor sustainability emerged and was largely due to poor future planning and short-term benefit with less long-term impact. Procrastination of CBA implementation because of resentment and disapprove from the community, lack of supported infrastructure, and issues with equity and access towards decision making. Creating evidence to motivate the communities to continue CBA program and ensuring that the community can continue the implemented program independently. Integrate CBA programs that are concerned with environmental vulnerability (especially climate change vulnerability) with other vulnerabilities in the community, such as livelihood vulnerability.
Community-Based Adaptation: Challenge and Opportunity in Indonesia (2021)	<ul style="list-style-type: none"> CBA can give positive impact toward environment, social, and economic aspect. Some 	<ul style="list-style-type: none"> Implementation of CBA have several barriers, such as limited funds, human resources, communication,

<p>Science to Practice: Lesson Learn from Community Based Adaptation in Semi-Arid Region of Indonesia (Strategic Planning and Actions to Strengthen Climate Resilience of Rural Community (SPARC), (2013—2016)</p>	<p>of positive impact that identified: increasing community understanding towards resources, developed eco-tourism program, expand more funding for program implementation.</p> <ul style="list-style-type: none"> • CBA contribute to shaping community resilience on disaster management, aquaculture, food, and water. • CBA accelerate community strategies to deal with environment and climate issues, for example use low-cost strategy such as recycling. • CBA expanded environmental-friendly activities for the communities, such as variety cultivation of plans and livestock. It enhanced community's economy and well-being. • CBA contribute to create sustainable infrastructure for the community, such as solar pump and pipeland that accelerate yield of plant cultivation. • CBA open access for knowledge that develop community's capacity through filed school. 	<p>government and institutions, technology, infrastructure, power, and inequality.</p> <ul style="list-style-type: none"> • CBA may not involve local communities from decision-making, which may negatively impact program implementation. • There is not any evaluation and monitoring of CBA program implementation. • Possibility that the community does not implement the CBA program sustainably. • Create suitable monitoring and evaluation mechanism that can control efficiency and effectiveness of the CBA program. Especially for inter-island CBAs, which require more expenses for accommodation and transportation. • Encourage local activities that can be sustained after the project ends. • The unavailability of a legal framework that directly regulate the CBA program. • Improve budget utilization efficiency and effectiveness. • Integrated CBA implementation with strong local culture.
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The first literature CBA implementations were located in Pacific countries, namely Fiji, Federated States of Micronesia, Kiribati, and Vanuatu. The identification results show that the opportunity for CBA implementation in Pacific countries emphasizes increasing community capacity in tackling environmental damage, especially climate change. In addition,

the opportunity of CBA is also shown by the relationship with the concept of ecosystem-based adaptation (EbA). EbA refers to the use of biodiversity and ecosystem services as part of an overall adaptation strategy to assist communities in adapting to the adverse impacts of climate change [13]. This shows a positive indication that not only creates communal action with the community, but also prioritizes environmental sustainability in the future. Meanwhile, CBA challenges in Pacific countries tend to emphasize the sustainability of programs that are still weak. The weak sustainability of the program is also accompanied by low community motivation to implement the program and the focus of CBA programs that tend to prioritize vulnerability related to climate change. In fact, in society there are still many vulnerable aspects, one of which is economic vulnerability. The possibility of rejection from the community is also a challenge, especially in locations that still have a thick culture. The right approach to the community needs to be done to suppress potential conflicts so that the community can accept the new ideas offered, namely CBA. These challenges may be associated with the geographical conditions of Pacific countries that are archipelagic. Pacific countries are recorded to have a total number of 1779 islands with diverse geomorphological features, which are generally in the form of reef islands, volcanic high islands, and composite low islands [14]. Such diverse features are likely to complicate the integration of CBA programs so that program sustainability is difficult to realize.

The second literature reviewed represents the implementation of CBA in Bekasi, Indonesia, which is an urban area. Referring to the identification results, CBA opportunities found lead to positive impacts that can be received by the community in the face of climate change. CBA is identified to increase resilience and increase community creativity in tackling environmental problems, including climate change. Community creativity in tackling climate change as an opportunity is shown by the implementation of a low-budget strategy, for example by applying the principle of recycle. The formation of high community creativity is likely associated with CBA implementation locations in urban areas. High thinking power is influenced by various things, such as access to information to technology. Urban areas are areas that tend to have more knowledge resources [15]. Meanwhile, the challenges of CBA implementation in Bekasi, Indonesia emphasize the many possible barriers in program implementation, such as limited funds, infrastructure, and inequality. CBA program planning that does not involve the community is also a challenge for CBA which can have implications for less than optimal program implementation. Community involvement is a very important aspect in CBA, because the community is the main actor of the program. Comprehensive community involvement from the beginning to the end of the program strengthens the trust and willingness of the community in implementing the program. This is related to the issue of inequality in program implementation so that potential conflicts in program implementation can be minimized. Weak monitoring and evaluation is also a challenge for CBA implementation, resulting in the possibility of unsustainability of the program in the future. Based on this analysis, it can be seen that the implementation challenges in urban areas represented by CBA implementation in Bekasi, Indonesia are complex so that they require strong integration, communication and cooperation in overcoming them.

The third literature represents the implementation of CBA in East Nusa Tenggara (Nusa Tenggara Timur/NTT), Indonesia. Geographical conditions in NTT have similarities with geographical conditions in Pacific countries. One of them is seen from its shape in the form of islands. Despite similar geographical characteristics, the opportunities and challenges arising from CBA implementation are different. The opportunity for CBA implementation in

NTT emphasizes increasing community empowerment which has implications for increasing community independence. The empowerment includes agricultural empowerment that improves the economic level of the community to the development of environmentally friendly sustainable infrastructure. The opportunity is in line with CBA's principles of not only building local capacity to adapt to climate pressures, but also promoting human development, livelihood security, poverty reduction, and environmental conservation [9]. Meanwhile, CBA implementation challenges found tend to focus on low monitoring and evaluation of programs which have implications for the possibility of unsustainable programs. However, the potential for program sustainability from regional bank assistance was identified. Similar to the case of CBA implementation in Pacific countries, low monitoring and evaluation of programs may be influenced by archipelagic site conditions that require a lot of money. The implementation of CBA in NTT has raised challenges that have not appeared in other literature, namely the absence of a legal framework that regulates CBA programs. The legal framework is important in implementing CBA in NTT because it is also included as a local government program.

Based on the analysis above, mapping of the overall challenges and adaptation can be carried out. Table 2 and Table 3 show the resume of overall challenges and adaptation that can potentially be found in CBA implementation. In total, there are 6 possibilities of opportunities and 7 challenges that found. Opportunities and challenges that found here is specific and has different possibilities from other regions.

Table 2. Mapping of Overall CBA Opportunities Based on the Literature Reviewed

Opportunities	Category
1) Protect local ecosystem.	Sustainable environment
2) Improvement awareness, knowledge, and understanding about climate change, community, and resources.	Human development
3) Shape resilience and sustainable management, ex: on disaster management, aquaculture, food, and water.	Sustainable environment
4) Create innovative ways to protect the environment, ex: recycling as low-cost strategy and eco-tourism programs.	Human development
5) Create new jobs related to environment and ecosystem sustainability.	Increase economic and well-being
6) Opens the opportunity of activity funding resources.	Program sustainability

Based on Table 2, resume of overall opportunities from the implementation of CBA that found are protect local ecosystem, improve awareness, shape resilience, create innovation, create new jobs, and open funding access. Through CBA, awareness and knowledge related to climate change will be increased. People who have received education will have awareness, so they are able to create actions using the information obtained [16]. This public awareness has

given rise to disaster mitigation actions related to climate change. Actions carried out massively and simultaneously between individuals will form a disaster-resistant society thereby increasing the community's own capacity to respond to climate change. Various actions emerged as evidence of increasing community capacity in the form of locally based innovative methods, such as based on local resources, as well as community livelihoods [17]. According to the categorization, the opportunity to get sustainable environment and human development are more dominant.

Table 3. Mapping of CBA Challenges Based on the Literature Reviewed

Challenges	Categorization
1) Top-down plan with less community participatory, so that the trust, motivation, acceptance, and approval of the community tend to be low. If the community has opposite idea, have the potential to start conflict.	Build good and strong community relation
2) For non-government organization project, limited involvement of the government.	Integrating all actors
3) The existence of a leadership hierarchy makes it difficult to make decisions in several regions.	Build good and strong community relation
4) There is no regulation of climate change adaptation in region's regulation (Lack of legal framework)	Lack of supported legal framework
5) Lack of facility delayed community member participation (funds, human resources, communication, government and institutions, technology, infrastructure, power, and inequality).	Lack of supporting facilities and infrastructure
6) There is no monitoring and evaluation process.	Create effective, efficient, and sustainable project
7) Lack of project sustainability.	Create effective, efficient, and sustainable project

Based on Table 3, several implementing CBA has several challenges from CBA implementations are less participation, limited government involvement, leadership hierarchy, regulation, monitoring, project sustainability, and lack of facilities. Facilities are things that support a climate action implementation program [18]. Supporting facilities can be material or

non-material. Support in material facilities such as supporting infrastructure. The lack of infrastructure makes the community less motivated to participate in the implementation. Due to the lack of support from the community as implementers, the project is not sustainable. In addition, non-material facility support can be in the form of a lack of government support. The government's role is important in the sustainability of the Adapting Climate Change program [19]. However, based on the results of the literature study, shows that there is a lack of government participation which creates challenges in implementing CBA. The lack of this role will influence the regulation, monitoring, and evaluation of the implementation of the CBA program. From all the category of CBA challenges that found, challenges in building good and strong community relations and creating effective, efficient, and sustainable programs are more dominant.

4 Conclusion

Based on the explanation above, we can conclude that there are some opportunities and challenges of Community-Based Adaptation. Opportunities and challenges of CBA in many regions of the world have the same characteristics. On the other hand, they also have several specific characteristics. Through the results of the study, there are 6 possibilities of opportunities and 7 challenges that were found. The opportunities of CBA such as protect local ecosystem, improve awareness, shape resilience, create innovation, create new jobs, and open funding access. Then, the challenges found, for example less participation, limited government involvement, leadership hierarchy, regulation, monitoring, project sustainability, and lack of facilities. According to the review of this study, the CBA opportunities dominated found in sustainable environment and human development aspects. Meanwhile, the CBA challenges in this study dominated found in building good and strong community relations and creating effective, efficient, and sustainable programs aspects. The study can be used as a reference regarding CBA studies and can be used as material for consideration in policy development by the government.

References

- [1] Intergovernmental Panel on Climate Change (IPCC). 2018: *Global Warming of 1.5°C. An IPCC Special Report on The Impacts of Global Warming of 1.5°C*. Cambridge, UK and New York, NY, USA: Cambridge University Press.
- [2] Kabir, M., Habiba, U., Iqbal, M. Z., Shafiq, M., Farooqi, Z. R., Shah, A., & Khan, W. (2023, July). Impacts of anthropogenic activities & climate change resulting from increasing concentration of Carbon dioxide on environment in 21st Century; A Critical Review. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1194, No. 1, p. 012010). IOP Publishing.
- [3] The World Bank Group and Asian Development Bank. 2021. *Climate Risk Profile: Indonesia*. World Bank Publications: Washington DC.
- [4] Rudiarto, I., Handayani, W., & Sih Setyono, J. (2018). A regional perspective on urbanization and climate-related disasters in the northern coastal region of central Java, Indonesia. *land*, 7(1), 34.
- [5] United Nations, Department of Economic and Social Affairs, Population Division. 2018. *The World's Cities in 2018—Data Booklet* (ST/ESA/SER.A/417).
- [6] World Meteorological Organization (WMO). (2023). Heatwaves Show Importance of Health Early Warnings and Action Plans. <https://public.wmo.int/en/media/news/heatwaves-show-importance-of-health-early-warnings-and-action-plans>. Access by Desnanda Luklu Chusnia in 14th October 2023.
- [7] UNISDR. 2009. *UNISDR Terminology on Disaster Risk Reduction*. Geneva: UNISDR.
- [8] Huq, S., & Reid, H. (2007). Community-based adaptation: A vital approach to the threat climate change poses to the poor. London: International Institute for Environment and Development.
- [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.
- [10] Taylor Aiken, G., Middlemiss, L., Sallu, S., & Hauxwell-Baldwin, R. (2017). Researching climate change and community in neoliberal contexts: an emerging critical approach. *Wiley Interdisciplinary Reviews: Climate Change*, 8(4), e463.
- [11] Patton, M. O. 2002. *Qualitative Research and Evaluation Methods*. Thousand Oaks, CA: Sage
- [12] Cerna, L. 2013. *The Nature of Policy Change and Implementation: A Review of Different Theoretical Approaches*. Organisation for Economic Co-Operation and Development (OECD).
- [13] CBD, 2009. *Connecting biodiversity and climate change mitigation and adaptation. Report of the second ad Hoc Technical Expert Group and Climate Change*. CBD Technical series No. 41. Secretariat of the convention on Biological Diversity.
- [14] Nunn, P. D., Kumar, L., Eliot, I., & McLean, R. F. (2016). Classifying pacific islands. *Geoscience Letters*, 3(1), 1-19.
- [15] Wood, R.M. (2023). A Review on Education differences in Urban and Rural Areas. *Journal of Educational Research*, 14(2), 1-3.
- [16] Kotchoubey, B. (2018). Human Consciousness: Where Is It from and What Is It For. *Front. Psychol.* 9:567.

- [17] Fios, F., & Prameswari, D. P. (2023). Maintaining the Relationship between Local Communities and Environment through Tfuá Ton Ritual at North Central Timor towards Sustainable Ecological in Industry 4.0 Era. In *E3S Web of Conferences*, 426, 02066
- [18] Vallejo, L., & Mullan, M. (2017). *Climate-Resilient Infrastructure: Getting The Policies Right*. Paris: OECD Publishing
- [19] Cimato, F., & Mullan, M. (2010). *Adapting to Climate Change: Analysing The Role of Government*. London: Department of Environment Food and Rural Affairs