

Strategic Integration of Climate Change Adaptation and Mitigation to support Climate Village Program in Rural Indonesia

Mandra Moh. Ahsan S.*, Amir Faizal and Mithen

Faculty of Engineering, Universitas Negeri Makassar, INDONESIA

*mohammad.ahsan.sm@unm.ac.id

Abstract

This study was related to climate change adaptation and mitigation in the rural community. Its primary objective was to determine a strategy for community empowerment through the integration of mitigation and adaptation actions to support the Climate Village program (PROKLIM). The Participatory Rural Appraisal (PRA) and FGD were adopted to facilitate community in action plan development. SWOT analysis and Analytical Hierarchy Process (AHP) were used to identify and select the most viable strategies based on their weighted scores.

From the SWOT analysis, eight alternative strategies were formulated including: (1) optimizing the use of local natural resources (SO1), (2) enhancing community capacity in adaptation and mitigation (knowledge, attitudes and skills) (SO2), (3) strengthening collaborations with both governmental and non-governmental organizations (WO1), (4) augmenting financial support from village funds for adaptation and mitigation efforts (WO2), (5) reinforcing continuous training of local groups (ST1), (6) enhancing natural resource management to increase community income (ST2), (7) increasing the capacity of the local village government (WT1) and (8) promoting the benefits of Climate Village program awareness and the importance of environmental protection (WT2). Through the AHP, three strategies were found to have the highest weight as follows: (1) SO2, (2) WO2 and, (3) WO1.

Keywords: Strategy, Implementation, Adaptation, Mitigation, Climate Change.

Introduction

The development of human civilization is associated with both positive and negative impacts on life. However, it becomes evident that one of the major challenges faced today is global warming, primarily driven by the increasing concentration of greenhouse gas (GHG) emissions in the atmosphere. The consequences of the phenomenon result in climate change, causing widespread losses, disasters and health issues¹. Climate change has repercussions on national development, leading to rising temperatures and changes in natural resource availability². Currently, global warming is a central topic of discussion worldwide, closely linked to the

escalating levels of CO₂ in the atmosphere leading to the proliferation of greenhouse gases. Windarni et al³, observed that deforestation causes a decrease in the capacity of the Earth to absorb carbon dioxide, contributing to increased CO₂ concentrations, and, consequently, rise in temperatures.

In response to the pressing issue of climate change, various stakeholders including the community, have to acquire the knowledge and skills necessary to support environmental conservation program^{4,5}. An environmental conservation program designed to address the issue is the Climate Village Program (PROKLIM). The program is a strategic initiative carried out by the Indonesian Government to engage the community in concrete actions against climate change⁶. The integration of the Climate Village program aims to increase public understanding of the issue and its impacts, thereby motivating the community to carry out environmental mitigation and adaptation measures⁷.

Environmental adaptation incorporates actions taken to adjust to the effects of climate and environmental change while mitigation efforts are directed at reducing global greenhouse gas emissions. Through adaptation efforts, it is anticipated that community resilience will be enhanced, thereby mitigating the risks associated with climate-related disasters. The efforts may include the development of climate-resilient infrastructure, the strengthening of economic, social and educational capacities and the application of technologies tailored to local conditions⁸. In addition to adaptation, the community should be encouraged to take mitigation actions to reduce global greenhouse gas emissions.

Laikang village is situated in the Mangarabombang district, Takalar Regency, South Sulawesi province. The village has considerable agricultural potential with expansive tracts of land and a robust livestock sector, making it a hub for beef cattle development in South Sulawesi.

However, the potential is largely untapped and the environmental management practices carried out by the village remain rudimentary. This shows that agricultural and livestock waste have led to environmental pollution, health issue and general discomfort⁹.

The residents of Laikang village still lack the necessary knowledge and skills to utilize and process agricultural and livestock waste. This is primarily attributed to the limited awareness and expertise within the community, coupled with the lack of Government support for utilizing and

processing the local resources that could substantially foster the well-being and economic prospects of the community¹⁰.

Material and Methods

This study used a mixed-method approach, combining both qualitative and quantitative methods, to comprehensively address community empowerment. The methodology included (1) Participatory Rural Appraisal (PRA) which emphasized community engagement across all stages of program activities, ranging from planning and integration to the evaluating of results, (2) SWOT analysis (Strength, Weakness, Opportunity and Threats) was used to assess alternative solutions and (3) Selection of problem-solving alternatives through Analytical Hierarchy Process (AHP) based on their feasibility, efficiency and acceptance within the social system. The stages carried out in the PRA method consisted of (1) Mapping of areas and activities, (2) situation analysis and (3) identification of changes that occurred⁷.

The study was conducted in Laikang village, Managarabombang District, Takalar Regency, South Sulawesi, Indonesia and consisted of farmer and breeder

groups. The analysis spanned eight months from January to September 2023 and the flow chart outlining the analysis process is shown in fig. 1.

Results and Discussion

Descriptive Analysis Result: The analysis results using the PRA method showed several priority problems faced by the community including (1) low knowledge and skills regarding climate change adaptation and mitigation, resulting in a low level of concern about such issue. The knowledge gap could have adverse consequences for the environment and public health, (2) the community lacked knowledge and skills about adaptation and mitigation technologies that could mitigate the impacts of climate change, (3) the community lacked knowledge and skills about clean and healthy living behavior, (4) lack of community awareness about the benefits of the Climate Village program for sustaining local development, (5) lack of community awareness to be engaged in the program and (6) there were no local institutions at the community level that supported the sustainability of the Climate Village program.

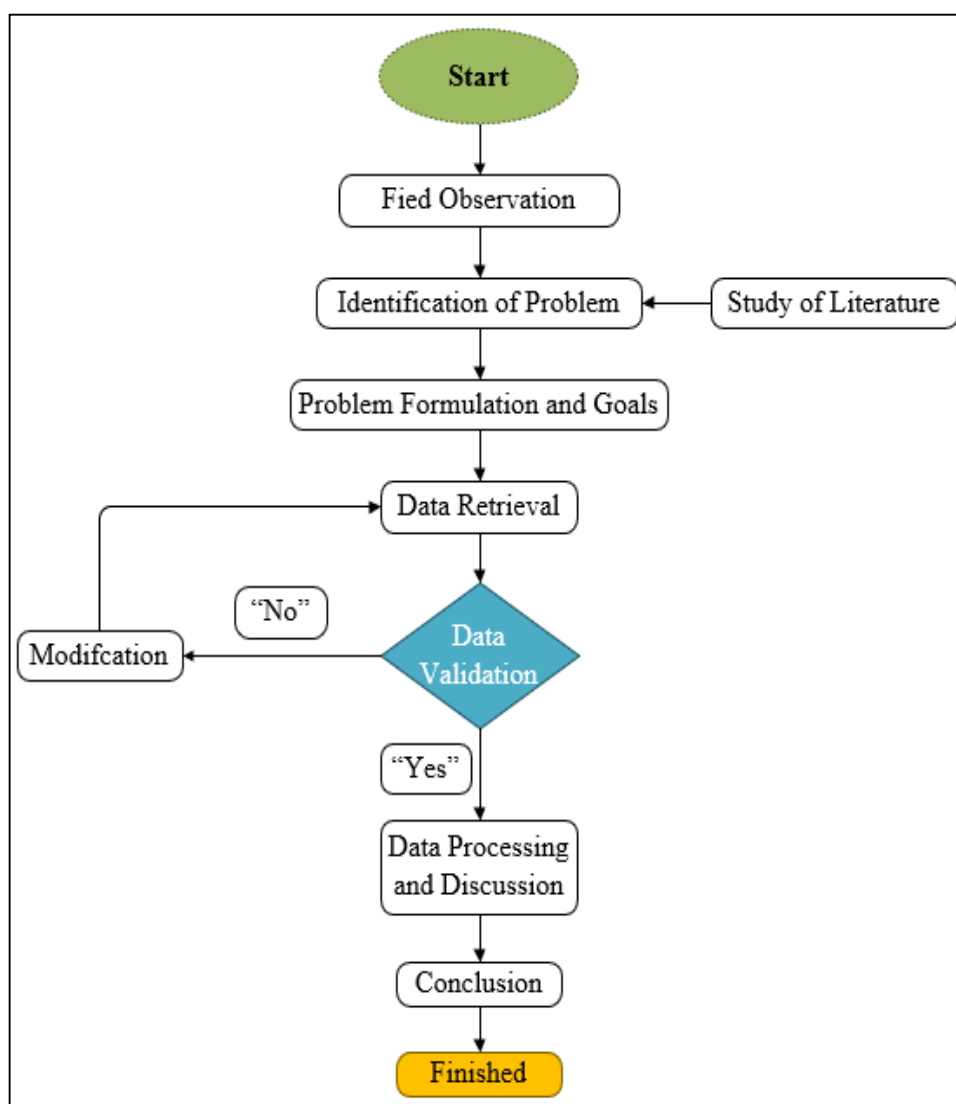


Figure 1: Study Flow Chart

Table 1
Descriptive Analysis Result

Mean	Median	Modus	Standard deviation	Max	Min
2.15	2	2	0.33	4	2

Table 2
Category of Needs Assessment Analysis Result

Respondent Score	Category	F	Percentage
$X \geq 10$	Very High	2	4%
$10 > x \geq 7.5$	High	5	10%
$7.5 > x > 5$	Low	31	62%
$X < 5$	Very low	12	24%

Based on this description, an alternative solution to the issue was the development of a community empowerment strategy focused on climate change adaptation and mitigation to support the Climate Village program. Integrating the strategy could have led to multiple benefits including improved community behavior and the protection of the environment from the negative impacts of climate change. It could have also helped to transform those who did not currently practice clean and healthy living behaviors, ultimately enhancing the health and welfare of the community. The analysis results of the community needs related to climate change adaptation and mitigation are presented in table 2.

Regarding climate change adaptation and mitigation program, 62% and 24% of the community fell into the low and very low categories respectively as indicated in table 2. Only 10% and 4% of the community were in the high and very high categories, indicating the need for strategies related to the program. Empowerment program, on the other hand, could have increased community capacity and resilience to the negative impacts of climate change through adaptation and mitigation activities. From a social perspective, such a program could have educated the community on how climate change adaptation and mitigation activities could also result in economic benefits while preserving the environment.

SWOT Analysis: Through FGD with stakeholders, several challenges were identified in the integration of climate change adaptation and mitigation program in Laikang village. These included: (1) limited understanding of the impact of climate change on their lives, (2) the community capacity regarding knowledge, motivation and skills for adaptation and mitigation program, remained at a low level, (3) there was a low community awareness and participation in climate change adaptation and mitigation activities and (4) the support from the local government for the integration of climate change adaptation and mitigation actions was not yet intensive. Table 3 showed the results of the Internal factor evaluation (IFE) and external factor evaluation (EFE) which

could be perceived as opportunities and threats, along with their respective weights.

Based on the SWOT matrix, eight alternative strategies were developed as follows: (1) Optimizing the use of local natural resources (SO1), (2) enhancing community capacity in adaptation and mitigation (knowledge, attitudes and skills) (SO2), (3) strengthening collaborations with governmental and non-governmental organizations (WO1), (4) augmenting financial support from village funds for adaptation and mitigation efforts (WO2), (5) reinforcing local institutions through continuous training of local groups (ST1), (6) enhancing natural resource management to increase community income (ST2), (7) increasing the capacity of the local village government (WT1) and (8) promoting awareness about the benefits of the Climate Village program and the importance of environmental preservation (WT2).

AHP Analysis: To determine the prioritization of these strategies, the AHP method was adopted, utilizing expert choice software. After identifying the criteria and sub-criteria obtained from the SWOT matrix, a questionnaire was created based on such criteria. Two experts, one in the field of animal husbandry and the other in energy resources were surveyed. The hierarchical model used in this study was shown in figure 2.

The results of AHP data analysis showed that the weighted order for each alternative strategy included ST1 = 0.092, WO2 = 0.158, WO1 = 0.135, WT1 = 0.105, SO2 = 0.315, SO1 = 0.083, WT2 = 0.060 and ST2 = 0.052.

Therefore, the three strategies with the highest weights were: (1) enhancing community capacity in adaptation and mitigation (knowledge, attitudes and skills) (SO2), (2) increasing financial support from village funds for adaptation and mitigation efforts (WO2) and (3) strengthening collaborations with both governmental and non-governmental organizations (WO1).

Table 3
Internal and External Factor Evaluation

Internal Factors	Weight	Rating	Score
STRENGTH (S)			
1. The potential of local natural resources in the community.	0.15	4	0.60
2. The potential of human resources of the community.	0.10	3	0.30
3. Village government independence in determining appropriate adaptation and mitigation actions.	0.10	3	0.30
4. There is an allocation of village funds for implementing mitigation and adaptation actions.	0.05	3	0.15
5. There are local community groups that have been formed in the society.	0.05	2	0.10
6. Openness and acceptance of the community towards implementing adaptation and mitigation actions.	0.10	4	0.40
7. Local wisdom of each village to face the impacts of climate change.	0.05	4	0.20
WEAKNESS (W)			
1. Community education and knowledge was relatively low.	0.05	2	0.10
2. Community awareness was relatively low.	0.05	1	0.05
3. Community skill was relatively low.	0.05	1	0.05
4. Pro-environmental attitude of the community is still low.	0.05	2	0.10
5. Local institutional capacity was still low.	0.10	1	0.10
6. Village government capacity in program development was still low.	0.05	2	0.10
7. Village government budgets for adaptation and mitigation action activities are still low.	0.05	2	0.10
Total	1.00		2.65
External Strategy Factors	Weight	Rating	Score
OPPORTUNITY (O)			
1. There are government incentives related to adaptation and mitigation actions.	0.10	4	0.20
2. Collaboration and sharing with the campus community.	0.10	3	0.15
3. Collaboration and sharing with industry parties using CSR funds.	0.10	2	0.20
4. Cooperation and sharing with national and international non-governmental organizations.	0.05	2	0.10
5. Increasing income and rural community welfare by reducing climate change impacts.	0.10	3	0.30
THREAT (T)			
1. Competition to get incentive funds from the government with other villages	0.10	2	0.20
2. Central and regional government budgets are limited in funding adaptation and mitigation actions.	0.05	3	0.15
3. Lack of socialization from central and regional governments about the benefits of the adaptation and mitigation actions.	0.10	2	0.20
4. Lack of assistance from central and regional governments in adaptation and mitigation activities.	0.05	2	0.05
5. Lack of appreciation from central and regional governments in adaptation and mitigation activities.	0.05	2	0.10
6. Lack of attention from industry to support funding for adaptation and mitigation actions.	0.05	3	0.15
7. Economic uncertainty.	0.15	1	0.15
Total	1.00		2.30

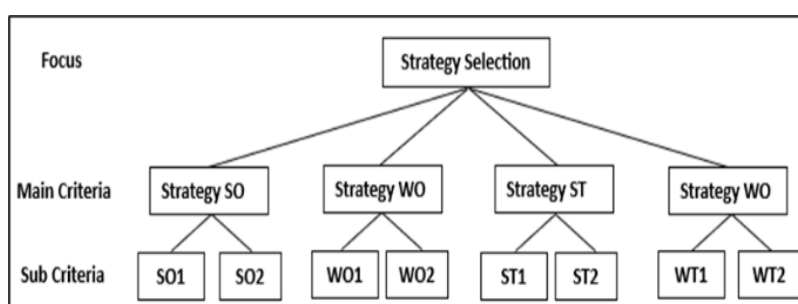


Figure 2: Strategy Selection Hierarchy

Discussion

Based on the analysis results, the integration strategy for climate change adaptation and mitigation to support the Climate Village program prioritized three key actions. The actions included: (1) enhancing the community capacity for adaptation and mitigation (knowledge, attitudes and skills), (2) increasing financial support from village funds for adaptation and mitigation efforts and (3) strengthening collaborations with both governmental and non-government organizations. This strategy was supported by the study of¹¹ that climate change mitigation could be achieved through effective waste management, increasing vegetation cover and promoting sustainable agricultural practices. Similarly, Rahmah¹² suggested that Government engagement in forming a special integration team could enhance the use of the Climate Change Adaptation and Mitigation Program, particularly for biogas users.

The results of Windarni et al¹³ also underscored the importance of community adaptation measures including drought control, flood management and improved food security. Mitigation activities comprised of effective waste management, sustainable agriculture practices and the promotion of increased vegetation cover. Regarding the integration of the Climate Village program, it was evident that the Ngadirejo Climate Village community had demonstrated a strong sense of independence, fulfilling the indicators of proactive behavior and decision-making initiative. The independence was reflected in the proactive steps such as caring for plants and the awareness of the consequences of their actions to voluntarily participate in the program without external coercion.

Conclusion

In conclusion, through the SWOT analysis, eight alternative strategies were identified for the development of adaptation and mitigation technologies in Laikang village including SO1, SO2, WO1, WO2, ST1, ST2, WT1 and WT2. Using the AHP method, strategic priorities were determined based on the weighted values (1) enhancing the community capacity for adaptation and mitigation (knowledge, attitudes and skills) (SO2), (2) increasing financial support from village funds for adaptation and mitigation actions (WO2) and (3) strengthening collaborations with both governmental and non-governmental organizations (WO1).

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