

Research Article

Community Adaptation Strategies in the Face of Climate Change for Sustainable Social Development

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ORCIDDiana Catur Rini: <https://orcid.org/0009-0000-2383-1585>Vidia Lestari: <https://orcid.org/0009-0008-8050-4458>**Abstract.**

Climate change has become a pressing global issue with many countries becoming increasingly aware of its impacts. In Indonesia, over 70% of hydrometeorological disasters, such as floods, droughts, biodiversity loss, hails, and landslides, are linked to climate change. One contributing factors is inadequate waste management. This study aims to evaluate the effectiveness of the pentahelix model in mitigating climate change in the village of Kembaran, Tamantirto District, Bantul Regency during 2023–2024. Using a case study approach, the research involves collaboration among academia, businesses, community organizations, government, and media, within the pentahelix framework. The novelty of this research lies in its gender-responsive, community empowerment approach to waste management efforts. The results indicate that the pentahelix model has been effective in improving waste management in Kembaran Village. These findings offer valuable recommendations for policymakers in advancing climate change mitigation, particularly in addressing waste-related issues.

Keywords: community empowerment, pentahelix, gender

1. INTRODUCTION

This research was conducted in the face of the escalating global climate crisis, which is having a significant impact on communities around the world. In the face of the escalating global climate crisis, communities around the world are increasingly bearing the brunt of environmental changes, from rising sea levels to extreme weather events. This phenomenon, widely documented in climate studies, underscores the urgent need for effective community adaptation strategies to mitigate the adverse impacts of climate change.[1]

Environmental problems in the world also hit the country of Indonesia, the following is data from the Ministry of Environment and Forestry's Waste Management Information System (SIPSN) in 2022, showing terrible numbers. The input results from 202 districts

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or cities throughout Indonesia, said that the amount of national waste stockpiles reached 21.1 million tons.[2] Various kinds of waste or garbage if disposed of directly, it will cause environmental pollution, which in turn will harm living things in general, and humans in particular.

Environmental issues are not only the responsibility of policy makers but community involvement in handling the environment is also very important. Some individuals in society who gather and have a commitment to environmental issues form a larger group called the environmental care community. according to data released by SMERUS's Non Governmental Organization Database, the number of environmental care communities in Indonesia is the highest among other sector NGOs, namely 143 NGOs.[3] Although they have different main focuses, from the results of the author's interview with the HR field of the Surabaya Waste Care community, it does not rule out the possibility of support and collaboration between communities related to personnel needs in environmental action, article publication needs, data exchange, funding and others.

These communities certainly carry out various methods such as socialization, training, processing, publication, and research to continue to be able to echo the issue of environmental problems while providing real solutions in responding to these problems. Many communities use various adaptation strategies to address climate change.[4] To achieve sustainable social development, it is necessary to involve various levels of government and the private sector to support local initiatives. This research emphasizes the importance of integration between top-down adaptation strategies (government and national policies) and bottom-up efforts from communities.[5]

Based on the above problems, cooperation with various parties is needed, namely the involvement of academics, business, media, government, NGOs in the pentahelix model. This study aims to test the effectiveness of the pentahelix model in climate change mitigation in the village of Kembaran, Tamantirto District, Bantul Regency in 2023-2024. The novelty of this research lies in community empowerment through the gender-responsive pentahelix model in waste management efforts.

2. THEORETICAL STUDY

Pentahelix model has known as five elements of strength in developing the potential of villages and rural areas. Its involved which elements of government, academics, business, media and community to coordinate and commit to developing the local

potencial of village and rural areas that continue to prioritize local wisdom and local resources.[6–8] The involvement of various stakeholders in efforts to improve data accuracy is also very much needed especially in community development at waste management. Other study explained that the involvement of the five Pentahelix elements in tourism development requires strong collaboration in order to provide good benefits in tourism.[9]

3. METHODS

The research method is a case study involving the participation of academia, businesses, community organizations, government, and media (the pentahelix model) in climate change mitigation in the pedukuhan of Kembaran, village Tamantirto, Kasihan District, Bantul Regency in 2023-2024. Community in this village the built namely Sanggar Pawuhan whom care of environment issues.

4. RESULTS AND DISCUSSION

4.1. Result

This research is located in Pedukuhan Kembaran, Tamantirto Village, Kasihan Sub-district, Bantul Regency. The geographical condition of Tamantirto Village is a village located in Kasihan sub-district, Bantul regency, Special Region of Yogyakarta (D.I.Y). according to data from the Central Bureau of Statistics of Bantul Regency, Kasihan sub-district is located in the north of Bantul Regency, bordering several sub-districts, namely the North bordering Ngampilan sub-district, the East bordering Sewon sub-district, the South bordering Sewon and Pajangan sub-districts, the West bordering Pajangan sub-district.

Tamantirto area has an area of 6.81 km² or 21.22% of the area of Kasihan sub-district. with a population of 23,996 people consisting of 11,925 men and 12,071 women. In 2023 the highest number of rainy days was in February, namely 20 days with rainfall of 426 mm, while in September and October it did not rain in Kasihan Sub-district.

Economically, people in Tamantirto rely heavily on the agriculture, livestock, trade, and service sectors. In addition to agriculture as the majority of economic support, since 2010 the economic activities of the community in the Tamantirto area began to grow

the center of trade, industry, and services very quickly so that Tamantirto began to turn into a business and trade center and the center of massive financial turnover.

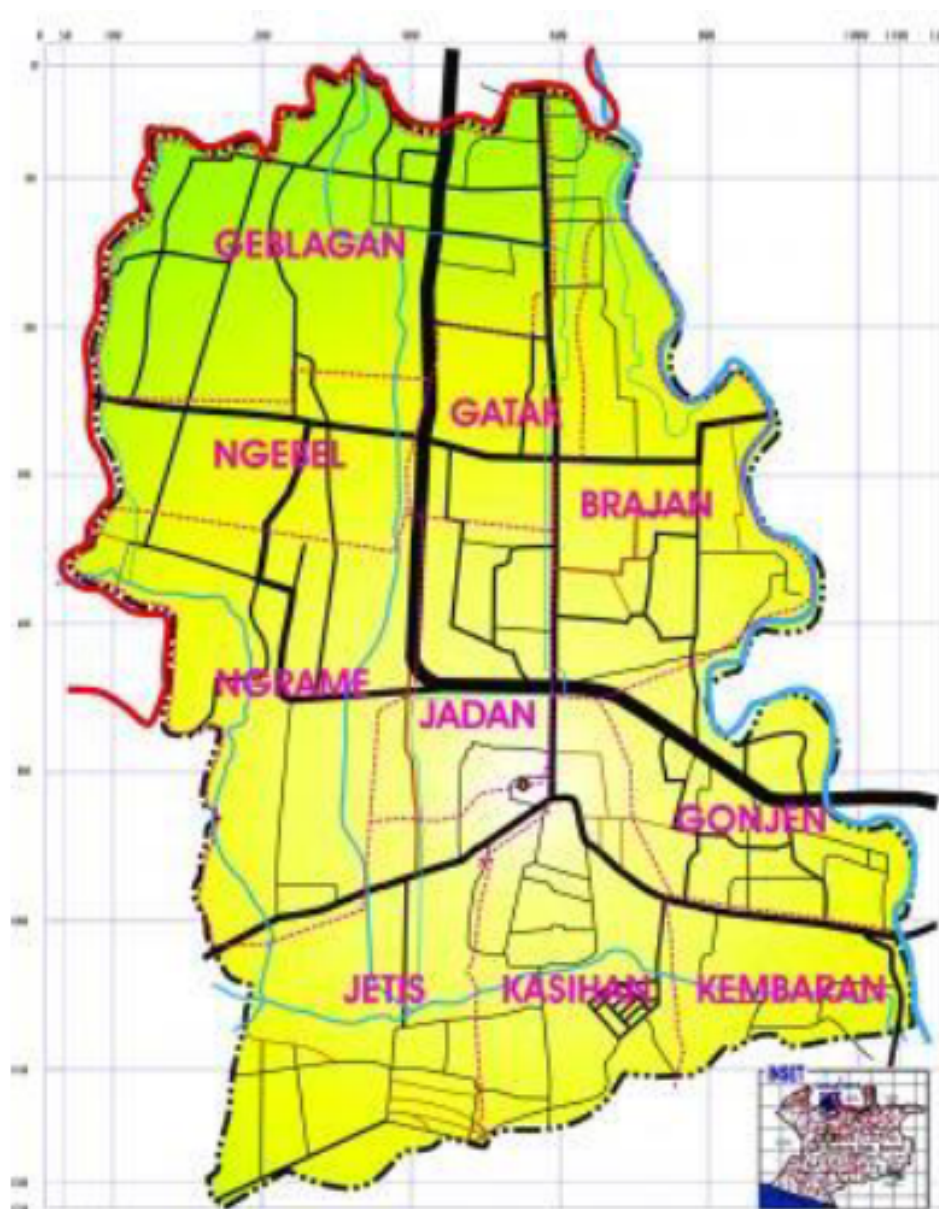


Figure 1: Administrative Area of Tamantirto Village.

The pentahelix model is a model involving elements academics, business world, media, government, NGO. Each has an important role in waste management in the Sanggar Pawuhan community, namely:

4.1.1. Academics

Cooperation with academics is equally important in efforts to deal with waste and climate change. They are qualified in theory and in the tri darma of higher education as well as a form of university service to the surrounding community. Sanggar Pawuhan community not only cooperates with public universities but also private universities. In the period 2023-2024, this community has collaborated with 4 universities, ranging from waste processing training, socializing the importance of wise waste management, community service, making eco enzyme, etc.

Collaborating with large campuses such as Gadjah Mada University (Faculty of Biology) where they have implemented simple technologies in managing organic waste such as vermicomposting using worms and BSF, organic liquid fertilizer (poc), eco enzymes, composting, and the use of biofertilizers from livestock urine. The results of research conducted by the campus are expected to be applied in the community. This means that the involvement of academics can increase the added value in processing organic waste. In addition to increasing the utilization of waste that can no longer be utilized, the application of the results of this research provides benefits to the environment and plants.

4.1.2. Business World

Businesses produce waste through the packaging of their products. The quantity of production continues, but they do not process the waste they produce. The problem becomes more complex when the waste produced by the industry does not yet have certain quality standards so that it is easy to recycle.

In 2023 the sanggar pawuhan community collaborated with a company engaged in tourism and hospitality education. Considering that the tourism sector in Yogyakarta is the main support for the economy, it is also necessary to pay attention to waste management issues. The hospitality industry produces a lot of waste, both organic and inorganic waste. The number of hotels that tend to increase causes its own problems in waste management.

The importance of raising awareness in waste management is important. The students are equipped with basic knowledge about the separation of organic and inorganic waste, waste management which then has a higher economic value, including making liquid organic fertilizer, making eco enzyme, making soap, etc. Inorganic

waste can be processed into handicrafts, making ecobricks, recycled bags, etc. These handicrafts will certainly be able to generate added value. If inorganic waste is just thrown away, it will certainly cause environmental damage.

4.1.3. Media

The media has a very important role, especially in disseminating information, in the context of media empowerment it also has a role in educating the community. Currently, the role of electronic media makes it very easy for people to find any information. Almost every activity of the pawuhan community involves the media in conveying information. The following are some news reports of community activities.



Figure 2: Training on waste management for households in Padukuhan Brajan.

The use of social media is currently considered effective in conveying information. The composition of the Indonesian population, which is generally the younger generation, also occurs in Tamantirto Village. The younger generation is very close to the use of gadgets and this can be utilized as a communication medium.

SONJO: Sambatan Jogja

#OraAnaSingKeri #OraKeri



Figure 3: SONJO-Sambatan Jogja, Waste Management.

Kolaborasi Pentahelix, Kunci Penanganan Sampah di Yogyakarta

jole5637
July 16, 2024 194 views



Rini Yuliana DY, Founder Sanggar Pawuhan, sedang mencoba memusnahkan residu-residu sampah di Tongtu disaksikan oleh Titi Widyawati dan Endah Palupi, Senin (15/7/2024). (jolali.jogja.com/Birul SA)



KABAR

- KABAR**
October 3, 2024
Kemah "Tepa Salira" di Sri
Keminut ...
- KABAR**
September 23, 2024
Petenis Aldilla Sutjiadi Lanjut
ke Beijing
- KABAR**
September 20, 2024
Berita PON XXI : Final Tennis
PON, ...

Figure 4: Pentahelix collaboration in the waste management.

4.1.4. Government

The government in this case is the central government and local governments. Regarding waste management, the central government has issued Law 18/2008 related to waste management containing various comprehensive provisions on waste management. However, the implementation in the field is still not optimally implemented. When compared to developed countries in Asia, waste management in Indonesia is still lagging behind. In addition to affirmation at the executive and legislative levels, it also needs to be supported by collaboration with various parties. the government

cannot run alone, nor can other stakeholders. The gap between policy and implementation in the field creates challenges for the community to innovate continuously. The capacity of a village head in this regard must be complex, understand advances in information and technology and continuously educate residents about developments in the village governance system related to various assistance programs carried out by the government in the welfare of society.[10]

4.1.5. NGO

Sanggar Pawuhan is an environmental community under the auspices of Yayasan Bumi Winaya Lestari. The vision of this community is to form a generation that is able to protect and care for Mother Earth. The mission of this community is to form people who care about nature and the environment, maintain and improve the quality of the environment through education, research and community empowerment so that a sustainable community order is formed, build and establish networks with all parties of good will to build a sustainable creative economy ecosystem.

The importance of understanding and supporting these community-led initiatives is paramount, as they offer practical, on-the-ground solutions that are often overlooked in broader policy discussions. The integration of local knowledge with scientific research in formulating adaptation strategies is increasingly recognized as a key factor in their effectiveness.[11] Communities, being at the frontline of climate impacts, possess unique insights and experiences that are critical in developing resilient and sustainable adaptation practices. The diversity of these community responses reflects the varied geographical, cultural, and socio-economic contexts, highlighting the need for tailored approaches in addressing climate change. As the global community grapples with the realities of a changing climate, the role of local communities in leading the charge towards adaptation becomes more evident.

The data shows that the 26-35 age group had the highest participation with 200 participants, while the over 65 age group had the lowest participation with 50 participants. This graph provides an overview of how different age groups contribute to community empowerment activities related to disaster mitigation.

Their strategies, while diverse, share a common goal: to create sustainable and resilient societies capable of withstanding the challenges posed by climate change. The exploration of these strategies is not just an academic exercise; it is a crucial step

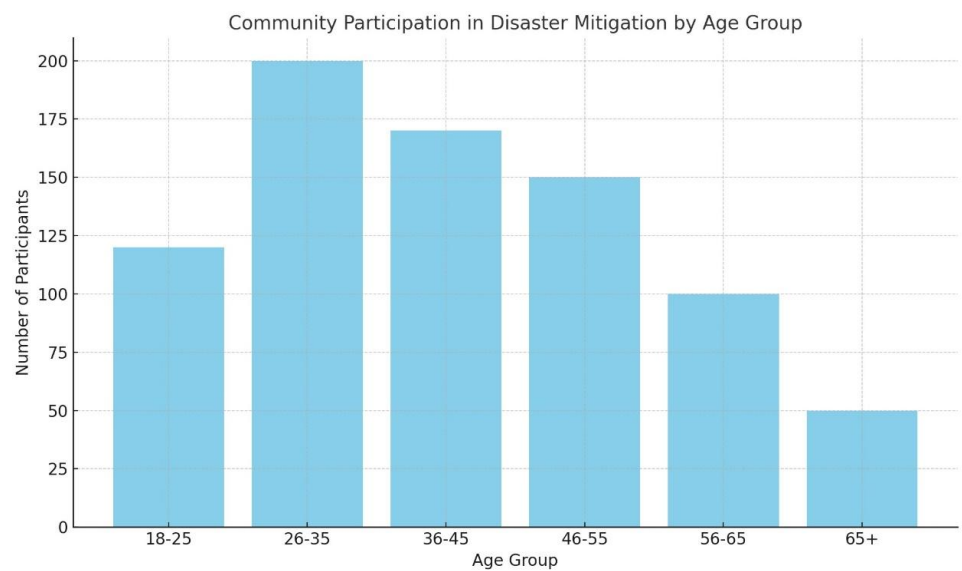


Figure 5: Community participation in disaster mitigation by age group (cultivated) .

in understanding how communities can survive and thrive in an increasingly unpredictable environment. By focusing on the grassroots level, the research offers valuable insights into the practical realities of climate adaptation, highlighting the innovative and resilient ways communities are responding to environmental challenges. In doing so, it contributes to the growing body of knowledge on climate change adaptation and underscores the importance of community-led initiatives in the global fight against climate change.

4.2. Discussion

Waste is becoming an increasingly crucial problem today. In various regions, the closure of landfills by the community has begun. In Yogyakarta, this also happened at the landfill in the Piyungan area, which was carried out by the surrounding community. This has caused confusion for the people of Yogyakarta. This is the concern of the sanggar pawuhan community in Tamanirto Village, Kasihan Bantul Sub-district, which cares about the environment and then forms a community with this pentahelix model.

Pentahelix-based thematic village development is an approach that integrates five key sectors, namely government, business, academia, community and media, to achieve sustainable village development and support the achievement of Sustainable Development Goals (SDGs) in Kasihan District, Yogyakarta. The policy model of thematic village development based on the PentaHelix framework, it is crucial to consider various factors highlighted in the literature. Thematic villages provide a platform for community

involvement and empowerment, leading to the creation of sustainable and unique village spaces. These spaces not only focus on community-based initiatives but also emphasize the active participation of stakeholders in developing local potentials to address societal challenges such as poverty and environmental improvements.

This research shows that these communities also have tremendous adaptive capacity through unique and adaptive locally-based approaches.[12] The strength of the community in Tamantirto Village has a strong character, they are relatively easy to accept new innovations that enter if it is considered to benefit the surrounding community. This was conveyed by the founder of the Sanggar Pawuhan community. In addition, the existence of a strong multi-culture in this area provides its own color in the context of community empowerment. The Muslim and Christian communities that live side by side with the law provide very good social capital. Likewise, the strength of the youth who are very open to technology and information.

Women are more concerned about potential environmental problems than men, so this study assumes that women are more likely to participate in environmental movements.[13] The role of mothers in this area is also very good, one of the key informants in this study said that the role of mothers is very enthusiastic when they are given awareness that waste management starts from the household scale, when waste is sorted wisely it can have added value for the family. In addition, the involvement of women in activities at the center also has a positive impact, the formation of waste banks and training in making eco enzyme which turns out to have tremendous benefits in domestic household affairs. This can include skills training, access to business capital, and women's participation in decision-making. Thus, this policy helps improve gender equality and empower women at the local level.[14]

The involvement of BUMDES is also considered effective in accelerating programs related to the environment. The development of village-owned enterprises (BUMDes) currently is one of the flagship programs of the central government and became policy in an effort to build rural areas.[15] One of Sanggar Pawuhan's community strategies is to actively involve one of the BUMDES administrators in environmental issues and waste management.

Schools are a strategic place to provide education. Children can learn at school, while adults and the elderly can attend training or group discussions. In 2023, Sanggar Pawuhan community collaborated with several elementary schools to educate elementary school children in Bantul Regency. Sanggar Pawuhan community has also

conducted camping and continued with mangrove planting in the South Beach area of Yogyakarta City. Tree planting is an important and strategic mitigation action in reducing disaster risk and protecting the environment. In addition to providing immediate protection against floods, landslides, and droughts, this initiative also provides long-term benefits in terms of improved air quality, carbon sequestration, and ecosystem restoration. Community involvement in the program is crucial to its long-term success and environmental sustainability.

The local government plays a major role in developing policies and coordinating the implementation of village development programs. Initial steps include identifying potential villages and creating regulations that support such development efforts. In addition, budget allocation for infrastructure, training, and human resource development is the government's responsibility in facilitating this initiative. The Pentahelix model is a comprehensive framework that promotes collaboration, drives sustainable development, and ensures the active participation of key stakeholders.[16]

5. CONCLUSION

This research concludes that the pentahelix model has proven to be effective in the field of waste management. A holistic approach to sustainable community development, which integrates economic, social, and environmental aspects to create unique and resilient communities. By utilizing local resources, engaging community members, and focusing on the potential to drive economic growth, empower communities, and preserve local identity in a sustainable manner. Future recommendations include several things that need to be done, including increasing the budget specifically for waste management.

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