

Mitigating the implementation of SDGs program no. 13 in Indonesia: an overview of social dynamics and local wisdom

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Abstract. This review critically examines the role of local wisdom in enhancing climate action as part of Sustainable Development Goal (SDG) No. 13 in Indonesia. The review explores key sectors including waste management, forest fire prevention, population dynamics, food security, and urban planning. Findings highlight that while local wisdom-based practices like "Tri Hita Karana" and customary land-use regulations are effective in mitigating environmental damage, scaling these approaches across diverse communities remains a challenge. Additionally, law enforcement against forest burning, coupled with traditional restorative justice, has shown promise in reducing environmental degradation. This review identifies significant gaps in policy integration, particularly in aligning local wisdom with national climate goals. Recommendations emphasize a more structured policy framework that incorporates traditional practices alongside modern mitigation strategies. This study aims to provide actionable insights for policymakers and stakeholders, offering a roadmap for integrating cultural heritage with climate action while also suggesting areas for future research in scaling up local initiatives.

1 Introduction

Climate change is a long-term change in global or regional weather patterns that lasts for decades or more. Causal factors include human activities such as greenhouse gas emissions and deforestation, as well as natural factors such as volcanic activity. This problem has been occurring since the early 20th century and is a major challenge for humanity in the 21st

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century, prompting the international community to seek effective and sustainable solutions [1]. In the global context, the Sustainable Development Goals (SDGs) designed by the United Nations, especially SDG 13, focus on actions to combat climate change and its impacts. Indonesia, as a large archipelago with high vulnerability to climate change, has adopted these goals with corresponding national strategies and policies [2].

In Indonesia, climate change has resulted in increased surface temperatures and various environmental threats such as changes in seasonal cycles, sea level rise, and decreased agricultural yields [3];[4]. Developing countries, including Indonesia, often have low capacity to respond to the impacts of climate change, which requires the participation and contribution of all individuals [5]. Indonesia's approach in implementing SDG 13 is not only based on top-down policies, but also involves local wisdom, which is a legacy of traditional knowledge that plays an important role in climate change adaptation and mitigation [6].

Local wisdom has proven to be an important asset in climate change mitigation efforts, and this research aims to explore how elements of local wisdom can be integrated in the implementation of SDG 13 in Indonesia. An approach that combines local wisdom with modern innovation and technology is expected to increase the effectiveness of mitigation efforts. Indonesia's unique social dynamics, including heterogeneous community structures and diverse value systems, play an important role in the implementation and adaptation of SDG 13 policies [7].

Climate change, driven by human activities like deforestation and greenhouse gas emissions, poses a critical threat to global ecosystems, with developing countries like Indonesia particularly vulnerable. Rising sea levels, shifting weather patterns, and declining agricultural productivity are among the prominent challenges. Within this context, the United Nations' SDG No. 13 aims to address climate change and its impacts globally. Indonesia, an archipelagic nation rich in biodiversity and cultural heritage, faces unique obstacles in implementing these goals.

The primary aim of this review is to examine how local wisdom can be integrated into Indonesia's national climate action strategies, specifically within the framework of SDG 13. This review focuses on four key areas: (1) Waste management, (2) Law enforcement against forest fires, (3) Food security in the face of climate change, and (4) Sustainable urban planning. The central research question driving this analysis is: How can local wisdom enhance climate mitigation strategies in Indonesia, and what are the challenges of integrating traditional practices with modern policies?

This review aims to offer policymakers new perspectives on leveraging local traditions for climate adaptation and mitigation, while identifying the gaps and challenges in aligning these practices with national objectives.

2 Research methods

This review adopts a systematic approach to exploring the intersection of local wisdom and climate action. Databases such as Google Scholar, Scopus, and ScienceDirect were used to search for relevant peer-reviewed articles, reports, and policy documents published between 2010 and 2023. The keywords included "local wisdom," "climate action," "SDG 13 Indonesia," "waste management," and "forest fire mitigation." Inclusion criteria focused on studies addressing the application of traditional knowledge to climate-related issues in Indonesia, while studies focusing solely on technical climate solutions were excluded. The literature review process involved a critical analysis of 50 selected studies, of which 30 directly addressed the integration of local wisdom in environmental management.

3 Discussions

3.1 Social dynamics and local wisdom

Indonesia is a country with rich cultural diversity and strong social dynamics, which influence the contribution of society in achieving sustainable development [8]. Social dynamics include changes that occur in the components of society over time, which can bring progressive or retrogressive changes in the social order [9]. Local wisdom includes knowledge and practices developed by local communities to deal with the challenges of their lives, such as reducing environmental impacts through collective activities such as shopping for vegetables with neighbors [10]. Local wisdom is also important in disaster mitigation and maintaining harmony between humans and the environment, making it a valuable asset in sustainable development [11].

3.2 Sustainable development goals no. 13: perspectives the implementation and local wisdom

The Sustainable Development Goals (SDGs) are a set of global goals designed to frame the policies and political agenda of UN member states until 2030. One of the important points in the SDGs is Goal 13, which aims to take immediate action to combat climate change and its impacts [12]. Climate change caused by human activities has caused various natural disasters, affecting lives, livelihoods and the economy, especially for the most vulnerable groups. Indonesia, as a country with cultural and geographic diversity, faces major challenges in implementing Goal 13 [13]. To achieve this goal, Indonesia focuses on strengthening adaptation and mitigation capacity, integrating climate policy into national plans, as well as increasing education and awareness regarding climate change [14].

In implementing the SDGs, Indonesia has adopted an approach that combines three main pillars: human development, socio-economic development and environmental development. The education sector is one of the main focuses in achieving the SDGs, with government efforts involving various stakeholders to ensure inclusive and equality education [15]. Apart from that, the industrial sector also plays an important role in driving economic growth and achieving SDGs targets. Information technology is used to improve the quality of education and prepare future generations to face global challenges. The SDGs development paradigm in Indonesia also considers climate change, with 12 of the 17 SDGs goals having climate-related targets [16].

3.2.1 Local Wisdom in mitigating waste management

Climate changes are driven by greenhouse gas emissions, where methane (CH₄) is the second most important greenhouse gas emissions after carbon dioxide. One of the main sources of methane is the anaerobic decomposition of organic waste, which underlines the importance of effective waste management. Local wisdom-based approaches such as the "*Tri Hita Karana*" concept in Bali can be a solution in sustainable waste management. This concept emphasizes harmony between humans, nature, and God, with values that motivate communities to protect their environment through real actions, such as wise and sustainable waste management [17].



Fig. 1. Tri Hita Karana concept

Local wisdom in various other regions also shows a significant contribution for waste management. For example, in Ebungfa Village, Jayapura, the community uses food waste as animal feed, reduces waste burning, and actively participates in individual waste management. In the Baduy region, Banten, mutual cooperation practices such as “*Dugdug Rempug*” also show how local culture can support better environmental management. This approach is not only effective in keeping the environment clean but also integrates local social and cultural values into daily practices [18].

3.2.2 Local wisdom in Indonesia's positive law enforcement against forest and land burning

In Indonesia, local wisdom plays an important role in enforcing positive laws against forest and land burning, through the integration of customary rules with government regulations [19]. Education on non-burning land clearing alternatives, as well as collaboration between the government, local communities and NGOs, has helped to monitor and prevent burning practices [20]. Restorative justice approaches, which involve perpetrators in the restoration of environmental damage, as well as the development of local wisdom-based regulations, such as the prohibition of land burning and traditional agricultural techniques, strengthen law enforcement and increase community participation in environmental protection [21].



Fig. 2. Land burning (*Javlec, 2016*)

In the context of land preparation, indigenous peoples follow strict customary rules, which require private land ownership and prior consent for the use of others' land. Prior to land clearing, customary leaders determine auspicious days through deliberation, and use nataki techniques to burn land with clear boundaries to control the fire [22]. Sanctions for violators are enforced by customary institutions, demonstrating community adherence to customary law in conflict prevention and land preservation. This shows that local wisdom and customary law not only support positive law enforcement but also combine traditional practices with modern regulations to effectively protect the environment [21].

3.2.3 Local wisdom and social dynamics of city areas and residential settlements that are inclusive, safe, resilient and sustainable

Indicators of safe settlements include sturdy houses, an environment that protects against extreme weather, affordable access to clean water, adequate sanitation, and a sense of security from forced eviction. Resilience is a key focus in the new urban agenda, with the Vernacular concept proposed to transform rundown neighborhoods into more sustainable ones through adapting planning, facades and urban settings. This concept-based development emphasizes translating residents' needs by involving them financially, creatively and in local culture, so that it is hoped that they can solve settlement problems appropriately and sustainably [23].

However, government programs in managing disaster risks due to climate change and problems in residential environments have not been effective. Programs are often short-term and partial, sometimes solving downstream problems without addressing their upstream sources. For example, the flood management program in Purworejo Regency actually caused flooding in other places due to poor drainage. Coastal residents who often face floods and tidal waves are used to this condition, especially because of their low economic level and lack of awareness of the dangers of slum environments. Therefore, climate resilience and disaster risk reduction programs must consider the integration of urban systems, social vulnerability, and the impacts of disasters spatially and in urban planning with modern regulations to protect the environment effectively [24].

3.2.4 Local wisdom in the implementation of environmental mitigation and adaptation through the climate village program (PROKLIM)

Strengthening community resilience through cultural preservation and local wisdom is an important step in dealing with climate change. The Climate Village Program (PROKLIM) is one of the Indonesian government's strategies to encourage community participation in environmental mitigation and adaptation. For example, in Laikang Village, South Sulawesi, the community has utilized animal manure into organic fertilizer as part of the mitigation and adaptation-based PROKLIM program, which also supports the acceleration of sustainable village development [25].



Fig. 3. Community adaptation through education on processing livestock waste into organic fertilizer in Laikang Village

In addition, other mitigation and adaptation programs include the application of drip irrigation technology to save water, the construction of infiltration wells, and rainwater harvesting to overcome drought and water scarcity. Local resource management is also optimized through the utilization of family medicinal plants and biogas energy from livestock, which helps reduce greenhouse gas emissions. With these measures, the community is expected to contribute to global efforts to reduce greenhouse gas emissions [26].

3.2.5 Local wisdom in overcoming climate change for food security

Climate change, which is characterized by changes in climate patterns and erratic weather phenomena, has a significant impact on the agricultural sector, which is very vulnerable to changes in temperature, humidity, rainfall and soil conditions. This impact affects plant growth, production results and national food security. Apart from natural factors, human awareness in managing the environment also plays an important role in dealing with climate change. For this reason, local wisdom values related to agriculture and food security need to be optimized as an adaptation effort [27]



Fig. 4. Agroforestry system for example (*pasarmikro.id, 2023*)

For example, the people of Lerep Village in West Ungaran District utilize local wisdom through an agroforestry system to face the challenges of climate change. By combining agriculture, fisheries and plantations, they grow crops other than rice such as coffee, cloves and fruit, so they are able to adapt to weather uncertainty and global warming. The

importance of environmental education is also recognized to equip the younger generation with an understanding of local wisdom and anticipation of climate change, considering that they are the successors who will protect this earth [28]

3.2.6 Local wisdom and its impact on the sustainability of city planning

Local wisdom in the form of daily activities, such as shopping from mobile vegetable vendors, reflects the community's knowledge and art in organizing life to meet needs. Shopping from mobile vegetable vendors not only strengthens collective communication and information exchange among citizens, but also reduces people's movement which can contribute to environmental preservation through reducing the use of motorized vehicles [29].

Even though itinerant vegetable traders often use motorized vehicles for mobility, their existence still maintains tradition and fulfills people's needs at competitive prices. Data on exhaust emissions from vehicles used by mobile traders, especially CO₂, shows that this mobility produces carbon emissions, which are calculated based on IPCC guidelines and national regulations. This emissions analysis provides insight into the environmental impacts of daily trading activities and the importance of considering sustainability in local practices [30].

3.2.7 Waste management and local wisdom

Local wisdom in Indonesia plays a pivotal role in sustainable waste management. For example, the Tri Hita Karana philosophy in Bali promotes balance between humans, nature, and spirituality, encouraging responsible waste disposal practices. However, the scalability of such practices across urban regions with different socio-cultural contexts remains limited. The integration of modern waste management technologies with traditional practices could improve waste reduction efforts, yet current government programs lack sufficient support for such hybrid solutions.

3.2.8 Forest fire prevention: law and customary practices

Indonesia's forest fires are a major contributor to global greenhouse gas emissions, exacerbated by land clearing practices. Customary laws, such as the nataki method practiced by indigenous groups, emphasize controlled land burning, aligning well with modern fire prevention laws. However, while local regulations have successfully reduced fire incidents in several regions, the broader enforcement of these traditional practices remains inconsistent, especially in remote areas. A comparison with countries like Brazil, which also struggles with deforestation, highlights the need for stronger policy alignment between local customs and national regulations.

3.2.9 Food security and agricultural practices

Local agricultural practices, such as the agroforestry systems in West Ungaran, demonstrate resilience in the face of climate change, providing both economic and environmental benefits. However, these systems often struggle to compete with industrialized farming, which prioritizes higher yields over sustainability. Integrating local wisdom with modern

agricultural techniques could enhance food security, but challenges remain in scaling up these practices to meet national demand.

3.2.10 Urban planning and local wisdom

Urbanization poses significant challenges for climate resilience, with many Indonesian cities experiencing infrastructure strain due to rapid growth. Vernacular architecture and community-based planning, which incorporate local knowledge of environmental risks, offer potential solutions for building resilient cities. Yet, current urban planning frameworks often marginalize these approaches in favor of standardized, top-down solutions. Comparative analysis with countries like India shows that incorporating local knowledge into national urban policies can enhance resilience and sustainability.

4 Conclusions

This review highlights the significant role of local wisdom in advancing climate change mitigation in Indonesia, particularly in waste management, forest fire prevention, and sustainable agriculture. However, the integration of these practices with national policies presents challenges in terms of scalability, enforcement, and sustainability. Key recommendations for policymakers include the development of hybrid models that combine local wisdom with modern environmental technologies, alongside greater community involvement in policy-making processes.

Future research should focus on identifying strategies for scaling up local wisdom-based approaches, particularly in urban areas and highly industrialized regions. Additionally, there is a need to explore the long-term sustainability of combining traditional practices with contemporary environmental strategies in Indonesia and beyond.

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