

The Young Generation as Agents of Climate Change Mitigation and Adaptation in Indonesia

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Abstract

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Climate change is a global challenge with significant impacts on the environment, human health, and socio-economic well-being, including in Indonesia, the world's largest archipelagic state. Rising greenhouse gas emissions from fossil fuel combustion, deforestation, and industrial activities have accelerated global warming, triggering sea level rise, extreme weather events, and the spread of climate-related diseases. Within this context, the young generation holds strategic potential as agents of change. Through education, eco-friendly innovations, policy advocacy, and community-based actions, young people can make substantial contributions to both mitigation and adaptation efforts. This article aims to examine the role of youth in addressing the climate crisis using a qualitative approach. The findings indicate that active youth involvement not only enhances environmental awareness but also fosters the development of sustainable innovations and policies aligned with local conditions. Therefore, empowering youth participation becomes essential for building climate resilience and ensuring long-term sustainability in Indonesia's response to the global climate crisis.

1. Introduction

Climate change is a long-term phenomenon that affects weather dynamics, global temperature, and climate variation. Its impact is not limited to temperature increases but also includes changes in the distribution of rainfall, the intensity of storms, and shifts in seasons. Scientific studies confirm that human activities, such as the burning of fossil fuels, deforestation, and industrialization, play a significant role in accelerating the climate crisis through the emission of greenhouse gases, including carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) (Rehman et al., 2020). These gases create a layer that traps heat in the atmosphere, increasing the Earth's average temperature and strengthening the greenhouse effect as the primary cause of global warming.

As the largest archipelago nation, Indonesia has a very high level of vulnerability to the impacts of climate change (Andreas, 2018). Its geographical condition, with thousands of islands of diverse topography and its position between two continents and two oceans, makes it prone to disasters and directly affected by climate change. Rising sea levels due to the melting of polar ice threaten coastal cities like Jakarta and Semarang, which are increasingly hit by tidal floods. Meanwhile, shifts in rainfall patterns cause prolonged droughts in East Java and East Nusa Tenggara, reducing agricultural productivity and threatening food security. In addition, public health is also affected by an increase in climate-based diseases such as Dengue Hemorrhagic Fever (DHF) and malaria. High humidity and temperature accelerate the life cycle of mosquitoes, which increases the risk of disease spread.

The impacts of climate change do not only cover ecological and health aspects but also extend to socio-economic dimensions. Communities that depend on the agricultural and fisheries sectors feel the greatest impact due to a decline in harvests and fish catches. This worsens social inequality, where poor and coastal communities become the most vulnerable with limited adaptive capacity. This condition confirms that climate change is a cross-sectoral issue that requires comprehensive handling.

Mitigation and adaptation efforts demand the active involvement of all stakeholders, from the government, the private sector, educational institutions, community organizations, and individuals. However, one important pillar that is often overlooked is the youth. With a large population, high creativity, rapid adaptability, and a close relationship with digital technology, young people have extraordinary potential as a driving force for change (Khan et al., 2022). Through social media, they are able to expand the reach of environmental issues, raise public awareness, and mobilize real action. Global movements like Fridays for Future, pioneered by Greta Thunberg, are strong evidence that the voices of young people can push international policy agendas.

In Indonesia, the contribution of young people is also visible through environmental communities growing in various regions (Kania et al., 2021). A real example is the Pandawara Group, which is actively cleaning up trash in coastal areas and public spaces. Their actions not only have a direct impact on the environment but also build broad community involvement. In addition, eco-friendly innovations born from the hands of the young generation, such as the eRecycle application and Internet of Things (IoT)-based recycling products, demonstrate their capacity to

present practical solutions that not only preserve the environment but also open up green economic opportunities.

Although awareness among young people about environmental issues is increasing, their role is often not positioned as a key player (Rousell & Cutter-Mackenzie-Knowles, 2020). Many studies still focus on the impact aspects of climate change, while the contributions of the young generation in mitigation and adaptation are less explored in depth. However, their potential to influence policy, expand social networks, and mobilize collective action can be a key to success in facing the climate crisis.

Therefore, this article aims to examine the strategic role of the young generation in facing climate change in Indonesia using a qualitative approach. This study focuses on their contributions to education, innovation, advocacy, and community action, while identifying the challenges that still limit their involvement. Through this analysis, it is hoped that a more comprehensive understanding and real encouragement will emerge for the young generation to be actively involved in building a sustainable, just, and resilient future against climate change.

2. Literature Review

Studies on climate change have been conducted across various disciplines, ranging from environmental science, health, and economics to social sciences. The literature generally affirms that climate change is a direct result of human activities that increase the concentration of greenhouse gases in the atmosphere. Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions are the main

contributors to the acceleration of global warming. This process leads to the melting of polar ice caps, rising sea levels, changes in rainfall distribution, and an increase in extreme weather events (Gahlawat & Lakra, 2020). These conditions threaten the sustainability of ecosystems, human health, and social-economic well-being (Ke et al., 2022).

In the context of Indonesia, the vulnerability to the climate crisis is quite high due to its geographical condition as an archipelago with thousands of islands (Satterthwaite et al., 2020). The real impacts that have emerged include tidal floods in coastal areas, prolonged droughts in eastern Indonesia, and threats to biodiversity such as orangutans, Sumatran tigers, and Javan rhinos. Furthermore, climate change contributes to an increase in climate-based diseases like malaria and dengue fever. Both diseases spread faster with rising temperatures and humidity (Arsin et al., 2020). This indicates that the climate issue is not just about the environment, but also about public health and socio-economic aspects.

The literature emphasizes the importance of two main strategies: mitigation and adaptation. Mitigation focuses on reducing emissions through a transition to renewable energy, energy efficiency, and halting deforestation. In contrast, adaptation is aimed at preparedness to face unavoidable impacts, such as building disaster-resilient infrastructure, sustainable water management, and diversifying agricultural systems to be more adaptive (Schuurman et al., 2022). However, the involvement of the younger generation in mitigation and adaptation is often overlooked. A number of recent studies show the unique capacity of young people to spread environmental awareness through digital technology and social media

(Karimi et al., 2021). The Fridays for Future movement is a global example of how young people can drive public policy through mass mobilization. In Indonesia, collective actions like those carried out by the Pandawara Group prove that youth participation has a real impact on the environment while increasing public awareness. In addition to community action, the role of the younger generation is also seen in eco-friendly innovation. Recycled products, digital waste management applications, and the use of the Internet of Things (IoT) for environmental monitoring demonstrate the creativity of young people in responding to global problems with local solutions.

From this literature review, it can be concluded that although the impacts of climate change have been widely discussed, the role of the younger generation as agents of change is still relatively underexplored, especially in Indonesia. Therefore, this article seeks to fill this gap by using a qualitative approach to delve deeper into the roles, challenges, and opportunities of young people in climate change mitigation and adaptation

3. Methods

This study uses a qualitative approach with the aim of deeply understanding the role of the young generation in climate change mitigation and adaptation in Indonesia. The qualitative approach was chosen because the climate issue is a complex phenomenon involving social, cultural, economic, and political aspects that cannot be explained quantitatively alone. With a qualitative approach, this research

emphasizes understanding the meaning, perspective, and experiences of the actors involved, especially the young generation as agents of change.

The data analyzed comes from scientific journals, international institution reports such as the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Environment Programme (UNEP), media articles, government policy documents, and publications of environmental communities driven by young people.

Data collection techniques were carried out through literature documentation. The respondents involved include young environmental activists, members of climate-conscious communities, students who are members of environmental organizations, and young people involved in eco-friendly technology innovation. Participatory observation was carried out by following field activities initiated by youth communities, such as beach clean-up actions and digital campaigns, to understand the real practices carried out in climate mitigation and adaptation efforts.

Data analysis was performed using a thematic analysis method. The themes identified include the role of the young generation in education, innovation, policy advocacy, and community action. In addition, researchers also examined the challenges faced by the young generation, such as limited policy support, minimal access to funding, and a lack of involvement in decision-making forums.

Data validity was maintained through the of sources and methods. Source was carried out scientific literature and policy documents. Meanwhile, method was carried out by document analysis. Thus, the findings obtained can be considered more comprehensive and credible. This qualitative approach allows the research not

only to describe the phenomenon but also to interpret the meaning behind the actions of the young generation in facing climate change. With a deeper understanding, this research is expected to provide a comprehensive picture of the contributions of the young generation while identifying strategies that can strengthen their role as agents of change at the local and national levels.

4. Results and Discussion

4.1. The Role of the Young Generation in Climate Change Mitigation and Adaptation

The results of this study show that the young generation in Indonesia has played an important and increasingly prominent role in the process of climate change mitigation and adaptation. This role is carried out through a number of strategic and complementary channels. The first prominent channel is education and environmental awareness campaigns (Han et al., 2018). Young people use the development of digital technology, especially social media such as Instagram, Twitter, and TikTok, as the main means to disseminate information related to the impacts of climate change and to provide education on simple mitigation steps that can be taken by the wider community. Digital campaigns, for example with popular hashtags such as ActOnClimate, and the international Fridays for Future movement pioneered by Greta Thunberg, are global sources of inspiration that are then replicated locally in Indonesia. Student communities, environmental activists, and independent youth groups use social media not only to convey messages but also to

create interactive spaces that allow for open discussion, sharing experiences, and strengthening collective awareness among community members.

The second channel that is a highlight is in the field of technology innovation and the creation of eco-friendly solutions. Many young people in Indonesia have taken the initiative to present innovations born from a concern for environmental problems and a desire to create practical solutions (Parker et al., 2018). Some forms of these innovations include the production of bags made from plastic waste, the development of digital applications such as eRecycle for waste management, and Internet of Things (IoT)-based waste management systems. Findings from participatory observation show that these creative ideas often start from real local problems, for example, the accumulation of waste in urban areas or limited access to energy in remote areas. These ideas are then developed into innovative solutions that can be replicated more widely, not only solving environmental problems but also opening up new economic opportunities based on the principles of sustainability. This proves that the young generation is able to combine social concern with a green entrepreneurial spirit.

In addition to education and innovation, another important role comes from local-based community actions. One prominent example is the Pandawara Group, a community of young people who are actively cleaning up beaches from plastic waste. Real actions like this show that the initiatives of the young generation can have a direct impact on local environmental conditions. Not only does it reduce pollution, but these activities also trigger the involvement of the surrounding community. To create social solidarity, strengthen environmental identity, and foster a sense of

belonging to the surrounding ecosystem. Thus, local actions carried out by young people can be a catalyst for wider changes in community behavior (Longhofer et al., 2019).

Another no less important channel is policy advocacy and involvement in the political sphere. The young generation has begun to take the advocacy route by initiating online petitions, organizing public campaigns, and participating in international forums such as the Conference of Parties (COP) (Hermwille, 2018). One real example is the involvement of Indonesian youth in the Youth for Climate Action network which demands that the government be more serious in targeting carbon emission reductions. Although its impact on public policy is still limited, this participation shows that the voices of the young generation are beginning to be taken into account in the global discourse on the climate crisis.

Many youth initiatives are run independently with limited resources so their sustainability is often not guaranteed. In addition, the low integration of climate issues in the educational curriculum causes most of the young generation not to have a deep understanding of the complexity of climate change issues. This condition becomes a structural barrier that reduces the effectiveness of the role of the young generation. Overall, the research results confirm that the young generation has a significant role in climate change mitigation and adaptation. They contribute through education, technology innovation, local community actions, and policy advocacy.

4.2. Challenges and Opportunities for the Young Generation as Agents of Change

In-depth In addition to describing the real roles, the research results also identify a number of challenges and opportunities faced by the young generation in climate mitigation and adaptation efforts. The first challenge is the lack of access to resources. Most youth movements are still volunteer-based with self-funding. This causes limitations in the scale of action that can be taken. Although they have great ideas and energy, their realization is often hampered by logistical and financial limitations.

The second challenge is the minimal involvement in formal decision-making. Many environmental policies are still made top-down without involving the voices of the young generation (Rana et al., 2020). This shows a gap between the potential of the young generation and the structural recognition of their role.

The third challenge is limited climate literacy. Although social media accelerates the spread of information, not all information circulating is accurate. Some young people are still stuck on superficial information, so their understanding of the complexity of climate is limited. This condition hampers the effectiveness of the environmental campaigns they carry out because the messages conveyed are not always based on strong science (Riley et al., 2021). However, behind these challenges, there are great opportunities that can be utilized. The young generation has an advantage in mastering digital technology which makes them the most effective communication agents for environmental issues. They are able to use social media

algorithms to reach millions of audiences in a short time, a strength that previous generations did not have.

The next opportunity is the spirit of innovation and social entrepreneurship. The young generation in Indonesia is increasingly showing interest in eco-friendly businesses, such as recycled products, organic farming, and small-scale renewable energy (Lubis, 2019). This opens the way for the creation of a green economy that can support mitigation efforts while improving welfare. In addition, global connectivity is another great opportunity. The young generation of Indonesia can connect with youth networks in various countries through international forums, global campaigns, or digital platforms.

This connectivity allows them to exchange ideas, strengthen solidarity, and access wider resources. This study also found that environmental and climate education can be the main key to strengthening the role of the young generation. The integration of climate issues into formal and non-formal curricula will increase the capacity of young people to understand problems, formulate solutions, and carry out real actions. With a stronger knowledge base, the young generation will not only become campaign agents but also policy designers, researchers, and innovators in the field of sustainability. Thus, although the young generation faces various challenges, they also have great opportunities to become the driving force for change. Their main strengths lie in their large population, mastery of technology, spirit of innovation, and global connectivity. If the challenges can be overcome with adequate structural support, the young generation has the potential to become a key player in creating a greener and more sustainable future for Indonesia.

5. Conclusion

Climate change is a global challenge whose impact is very real and widespread, both on the environment, health, and socio-economic aspects. Indonesia, as the largest archipelago nation, bears a great risk due to rising sea levels, changes in rainfall patterns, and an increase in climate-based diseases. In this context, the involvement of various parties in climate change mitigation and adaptation is a must, including the role of the young generation.

The results of this study show that the young generation has significant potential as agents of change. Through education and digital campaigns, they are able to build public awareness about climate issues. Through technology innovation and eco-friendly entrepreneurship, the young generation creates relevant local solutions while contributing to sustainable development. Community actions like the Pandawara Group's beach clean-up movement prove that the involvement of young people can have a direct impact on the environment while strengthening social solidarity. In addition, policy advocacy and participation in international forums show their ability to influence the direction of climate policy, although they still face limited access and formal recognition.

The main challenges faced by the young generation include limited resources, lack of substantive involvement in decision-making, and low climate literacy in some circles. However, great opportunities remain open through the mastery of digital technology, a spirit of innovation, and global connectivity. Therefore, support from the government, educational institutions, and the private sector is very much needed so that the contributions of the young generation can be more optimal. By

overcoming obstacles and maximizing opportunities, the young generation will not only be witnesses to climate change but also the main driving force in creating a greener, more sustainable, and more resilient future against the climate crisis.

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