Continuing Education for Climate Change Awareness in Elementary Schools

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Abstract

Climate change is a global issue with wide-ranging impacts on the environment, society, and economy. Environmental impacts include rising temperatures, sea-level rise, extreme weather, and species extinction; social impacts encompass health threats, poverty, mass displacement, and loss of livelihoods; while economic impacts are evident in reduced agricultural production, infrastructure damage, and disruptions in the energy and tourism sectors. Education plays a crucial role in shaping environmental awareness and sustainable behaviors. The integration of Environmental Education (EE) in primary school learning can instill sustainability values and support the achievement of Sustainable Development Goals (SDG) 4 and SDG 13. A Communication for Behavioural Impact (COMBI) approach serves as an effective strategy to encourage concrete actions among students and communities. This article reviews literature related to climate change impacts, public awareness, the role of education, and mitigation strategies through Education for Sustainable Development (ESD). Findings indicate that early educational interventions are pivotal in equipping future generations to address climate change challenges adaptively and transformatively.

1. Introduction

Climate change has become a global issue with significant impacts on the sustainability of life on Earth, affecting environmental, social, and economic aspects. From an environmental perspective, the increase in global temperatures, rising sea levels, changes in rainfall patterns, and the intensity of extreme weather have triggered species extinction and ecosystem damage. Socially, climate change poses threats to health, poverty, mass displacement due to natural disasters, and the loss of livelihoods for affected communities. The economic impacts are also evident, particularly in the agricultural, infrastructure, food security, labor productivity, and increased energy and healthcare costs sectors. The tourism sector also faces significant risks due to changing environmental conditions and extreme weather. This situation shows that climate change is not merely an environmental issue but a multidimensional challenge that affects all aspects of people's lives (Adger et al., 2022).

Various international efforts have been made to address climate change through global regulations and agreements, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. At the national level, several countries, including Indonesia, have implemented policies and regulations to reduce the impacts of climate change (Djalante, 2018). However, the effectiveness of these policies heavily depends on public awareness and participation. Studies show that the global community has a reasonably high level of awareness of climate change, but a low understanding of its personal impacts. Many individuals trust scientists and scientific institutions as sources of

information, and although support for mitigation actions is strong, actual participation in adaptive measures remains limited.

In the context of sustainable development, climate change is closely linked to the Sustainable Development Goals (SDGs), especially SDG 4 on quality education and SDG 13 on climate action. Quality education plays a crucial role in increasing public awareness and understanding of climate change, as well as in developing innovative solutions for mitigation and adaptation. Conversely, the worsening climate crisis can threaten access to and the quality of education, particularly in vulnerable areas (Barbier & Hochard, 2018). Therefore, education is a strategic sector for building the capacity of communities to face the impacts of climate change.

Environmental education (EE) in primary schools has a strategic role in instilling values of sustainability. Through EE, students not only gain knowledge about environmental issues but also develop caring attitudes and skills for taking concrete actions. The Communication for Behavioural Impact (CB) approach, or communication based on behavioral change, can also be used to encourage environmentally friendly behaviors both at school and at home. This strategy combines mass media, advocacy, and social media to influence the knowledge, attitudes, social norms, and behaviors of individuals and communities (Dempsey et al., 2018).

This article aims to explore the role of primary education in increasing awareness and mitigative actions against climate change, reviewing relevant literature on the impacts of climate change, public awareness, the role of education, and

behavioral change communication strategies. By positioning teachers as agents of change, primary schools can be the starting point for supporting the achievement of SDG 4 and SDG 13, and for shaping a generation capable of facing the challenges of climate change in an adaptive and transformative way.

2. Literature Review

Various studies affirm that climate change has a very broad impact on human life and environmental sustainability. Gulzar et al. (2021) emphasizes that the increase in global average temperatures, melting polar ice, and rising sea levels have increased the frequency of extreme natural disasters, such as floods, storms, and heatwaves, which not only damage ecosystems but also significantly threaten food security. This shows that climate change is not just an environmental phenomenon but a problem that can affect various aspects of human life simultaneously. Maja and Ayano (2021) highlight that countries with limited or impoverished resources are the most vulnerable to the impacts of climate change. Decreased agricultural yields due to drought, heatwaves, and extreme weather phenomena can cause significant economic growth slowdowns, widening the gap between developed and developing countries.

In addition to economic impacts, climate change also has serious social consequences. Mustak (2022) states that this phenomenon can trigger climate migration, where people are forced to leave disaster-affected areas, and increase the scramble for limited natural resources. This has the potential to cause social injustice, especially in structurally vulnerable areas. Yudatama et al. (2021) add that the

agricultural sector is highly sensitive to extreme weather, and disruptions in this sector can affect global food security, posing risks of food shortages and impacting social stability in various countries.

In the context of sustainable development, education is an important factor in shaping public awareness and ability to deal with the impacts of climate change. Hornsey and Fielding (2020) show that although global public awareness of climate change tends to increase, the level of active participation in mitigation actions remains relatively low. This is reinforced by Sparkman et al. (2021) who found that the main barriers include economic factors, social norms, and a consumptive lifestyle that is difficult to change.

Environmental Education (EE) is one of the effective strategies for building the awareness of the younger generation. Kelly et al. (2022) emphasize the importance of a communication approach based on behavioral change to increase active public involvement in environmental issues. In primary schools, teachers act as agents of change who instill values of sustainability through interactive learning and real projects. The integration of Education for Sustainable Development (ESD) into the curriculum is essential to increase students' understanding of the impact of human activities on climate change, while also supporting the achievement of SDG 4 related to quality education and SDG 13 on climate action. Thus, education from an early age can be a foundation for shaping a generation that is environmentally aware, capable of adaptive action, and contributes to climate change mitigation sustainably.

3. Methods

Study uses a qualitative approach with a library research method to gain a comprehensive understanding of the impacts of climate change, the role of environmental education, and its connection with the achievement of the Sustainable Development Goals (SDGs). The library research approach was chosen because it allows the researcher to examine, compare, and synthesize findings from various relevant literature sources, including books, scientific journals, research reports, policy documents, and official publications related to climate change, environmental education, and sustainable development. With this method, the research can produce an in-depth analysis of the relationship between environmental, social, and educational variables without the need for primary data collection.

The first stage of the research was to identify and collect relevant literature through physical libraries, electronic databases, and national and international academic portals. The criteria for selecting sources included topic relevance, author credibility, year of publication, and the validity of the data presented. The researcher focused on literature that discusses the impacts of climate change on the environment, society, and economy; the role of environmental education and education for sustainable development (ESD); and behavioral change communication strategies to increase public awareness and participation.

The second stage involved content analysis of the literature by critically reading, noting important findings, and grouping information according to the research themes. The literature data was categorized based on the environmental,

social, economic, educational, and climate change mitigation policy dimensions. This analysis aimed to find patterns, trends, and knowledge gaps in the literature, while formulating conclusions that could support the research arguments.

The next stage was the synthesis and interpretation of the findings. The researcher integrated the results of various previous studies to build a comprehensive conceptual framework regarding the impacts of climate change and the role of primary education in shaping awareness and environmentally friendly behavior. This synthesis also considered the interrelationship between the SDGs, particularly SDG 4 (Quality Education) and SDG 13 (Climate Action), so that the research not only emphasizes descriptive analysis but also provides practical recommendations for education and public policy.

By using the library research method, this study is able to present a holistic, in-depth, and systematic overview of the issue of climate change and relevant educational interventions, thereby making a significant contribution to the development of knowledge and sustainability practices.

4. Results and Discussion

4.1. The Impact of Climate Change and the Role of Primary Education

Climate change has become a global issue that has a significant impact on various aspects of human life, including environmental, social, and economic, thus becoming a major challenge for sustainable development efforts. The most visible environmental impacts include an increase in global average temperatures, rising sea levels, the intensity of extreme weather such as floods, storms, and heatwaves, and

the extinction of a number of species that disrupt the balance of ecosystems. This phenomenon not only affects natural habitats but also impacts the availability of natural resources and ecosystem services that are the basis for the sustainability of human life. This condition confirms that climate change is not merely an environmental issue but a multidimensional problem that requires serious attention from various sectors.

The social impact of climate change is also quite significant. The increase in temperature and environmental pollution triggers the emergence of various weather-related diseases, while the loss of livelihoods due to natural disasters and environmental damage increases the risk of poverty. The phenomenon of mass displacement due to natural disasters, often called climate migration, also poses additional social challenges, including competition for resources and the risk of social injustice in areas that are already vulnerable (Adger et al., 2018). In an economic context, important sectors such as agriculture, infrastructure, energy, and tourism are also affected. Decreased crop yields due to changes in rainfall patterns and heatwaves, damage to roads and public facilities, increased energy costs, and disruptions to the tourism sector are real evidence of how climate change can hinder economic growth and threaten social stability on a broad scale. This multidimensional impact emphasizes the need for a cross-sectoral approach and adaptive policies that can increase community resilience and minimize the risk of losses.

Various policies have been developed globally and nationally to face the challenges of climate change. International agreements, such as the United Nations

Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, emphasize the commitment of countries to reduce greenhouse gas emissions and increase adaptive capacity to the impacts of extreme climate (Abbass et al., 2022). At the national level, Indonesia has formulated a number of climate mitigation and adaptation laws and policies designed to reduce community vulnerability. However, the effectiveness of these policies heavily depends on active public participation. Hornsey and Fielding (2020) found that although global public awareness of climate change tends to increase, actual participation in mitigation actions remains low. The main barriers include economic limitations, social norms, and a consumptive lifestyle that is difficult to change. Therefore, the Communication for Behavioural Impact (CB) approach becomes an important strategy to encourage real action, combining mass media, advocacy, and social media to influence the knowledge, attitudes, social norms, and behaviors of individuals and communities.

In the realm of education, primary schools play a strategic role as the starting point for forming awareness and environmentally friendly behavior (Ricoy & Sánchez-Martínez, 2022). Environmental Education (EE) through interactive learning and real projects can instill values of sustainability while equipping students with mitigation and adaptation skills. Teachers act as agents of change who facilitate students' understanding of the relationship between human activities and the environment, emphasizing individual responsibility in maintaining ecological balance. The integration of Education for Sustainable Development (ESD) into the primary school curriculum allows students to understand the concepts of mitigation and adaptation from an early age, while also supporting the achievement of SDG 4

related to quality education and SDG 13 on climate action. The results of the study show that educational interventions from an early age can form consistent sustainable behavior, including proper waste disposal, energy saving, plant care, and active participation in community activities. Thus, primary education serves as an important foundation for shaping a generation that is environmentally aware, capable of adaptive action, and contributing to global sustainability.

4.2. Mitigation Strategies, Community Participation, and Policy Implications

Students awareness of climate change issues tends to increase significantly when teachers apply contextual and experience-based learning methods. This method combines a theoretical approach with real-world practice, so students not only understand concepts abstractly but also see and feel the impact directly. Learning strategies that involve environmental observation, recycling projects, tree planting, and plant maintenance activities around the school are proven effective in increasing students' understanding of the impacts of climate change on the environment and social life. In addition, the use of visual media, educational videos, and stories relevant to students' daily experiences can increase their interest in learning and active involvement in every activity (Nicolaou et al., 2019). The results of the literature review show that students who are active in Environmental Education (EE) activities are better able to recognize the consequences of human activities on nature and are more prepared to take concrete mitigative actions, including waste management, energy saving, and environmental preservation at home and school.

The role of parents and the community is also an important factor in shaping children's sustainable behavior. A supportive home environment, for example

through good waste management, energy saving, home greening, and participation in community environmental activities, reinforces the learning students receive at school. This confirms the importance of a collaborative and cross-sectoral approach between schools, homes, and communities to build consistent and sustainable environmentally friendly behavior. A study by Wamsler et al. (2020) shows that in urban areas, providing incentives or implementing clear regulations can encourage community participation in climate change mitigation actions. Therefore, public policy strategies should be accompanied by adequate education and a motivational behavioral approach, so that the targets of SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action) can be achieved effectively and equitably.

The integration of education, public policy, and behavioral change communication strategies is the main key to facing the complex challenges of climate change (Serra et al., 2022). Primary schools do not only function as a place for knowledge transfer but also as a laboratory for sustainable behavior, where children can learn, practice, and internalize environmental values. Systematic and structured educational interventions are able to produce a younger generation that is environmentally aware, understands the consequences of every human action, and is ready to contribute to climate change mitigation and adaptation efforts. The impact of climate change on food security, infrastructure, and social welfare requires interdisciplinary attention. The agricultural sector, which is vulnerable to extreme weather, requires the application of technological innovations and sustainable

agricultural practices, while infrastructure development must be designed to withstand disasters and increasingly intense climate change.

The results of the literature review show that a combination of education, policy, and active public participation can reduce the risk of disasters, increase community resilience, and strengthen the adaptive capacity of communities to climate change. Primary schools as centers of learning and sustainable action provide opportunities for children to become agents of change who influence the behavior of their families, neighbors, and communities, so that the positive impact of environmental education can spread throughout society. By instilling environmental awareness from an early age, children can form a more responsible, adaptive, and innovative generation in facing global challenges, supporting environmental, social, and economic resilience, and encouraging the achievement of the SDGs in a comprehensive and sustainable manner.

5. Conclusion

Climate change is a global challenge with widespread impacts on the environment, society, and economy, thus requiring an adaptive and transformative response from all sectors of society. Environmental impacts, such as rising temperatures, rising sea levels, extreme weather, and species extinction, disrupt the balance of ecosystems and threaten the sustainability of life. Social impacts include threats to health, poverty, mass displacement, and the loss of livelihoods, while economic impacts are seen in decreased agricultural yields, infrastructure damage, food supply chain disruptions, and increased energy and healthcare costs.

Education, especially at the primary school level, plays a strategic role in shaping environmental awareness and behavior. Environmental Education (EE) and the integration of Education for Sustainable Development (ESD) can instill values of sustainability, equip students with mitigation and adaptation skills, and support the achievement of SDG 4 and SDG 13. Teachers act as agents of change who facilitate interactive learning, while the role of family and community reinforces the formation of sustainable behavior. A behavioral change communication strategy is also needed to encourage real action at both individual and community levels.

The results of the study show that educational interventions from an early age can form a generation that is environmentally aware, understands the impact of human activities on climate change, and is able to contribute to mitigation and adaptation. A cross-sectoral approach involving schools, homes, communities, and public policy is key to success. Thus, primary education not only plays a role in knowledge transfer but also as a laboratory for the formation of sustainable behavior that can strengthen environmental, social, and economic resilience, while supporting the comprehensive achievement of the SDGs.

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