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# Education for Sustainable Development in Indonesian Primary Schools

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## Abstract

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Education for Sustainable Development (ESD) has emerged as a crucial global agenda to address increasingly complex environmental, social, and economic challenges. In Indonesia, the implementation of ESD at the elementary school level plays a fundamental role since primary education serves as the foundation for character formation, knowledge acquisition, and the development of sustainability awareness from an early age. However, its practical application still encounters serious obstacles, including limited infrastructure, insufficient teacher training, suboptimal curriculum integration, and inadequate funding. Sharp disparities also persist between urban and rural areas, where the quality of resources and access to technology remain uneven. This article employs a library research method to examine recent literature on the challenges and implications of ESD in Indonesian elementary schools. The findings reveal that ESD implementation has the potential to enhance critical thinking skills, sustainability literacy, and environmentally responsible character. Nevertheless, it requires strong policy support, continuous teacher capacity development, and equitable distribution of educational infrastructure to achieve effective outcomes.

## 1. Introduction

Education for Sustainable Development (ESD) has become one of the most important agendas in global policy, especially since the establishment of the Sustainable Development Goals (SDGs) by the United Nations (UN) in 2015. The SDGs place quality education as the fourth goal (Goal 4), with an emphasis that education is not limited to knowledge transfer but must also be able to foster critical awareness, social character, and a caring attitude towards environmental and social sustainability. In this framework, primary education holds a strategic position as it is the initial foundation for building awareness, knowledge, and skills related to sustainability issues. Learning at this stage can introduce students to the relationship between human actions and the preservation of nature, while also fostering the responsibility to protect the earth for future generations (Emina, 2021).

In Indonesia, the implementation of sustainable education has gained attention, particularly through the 2013 curriculum policy and the Merdeka Curriculum. Nevertheless, on-the-ground practices show various challenges that hinder the optimal implementation of ESD. One of the main obstacles is the limited infrastructure and educational resources. Many primary schools, especially in remote areas, still face problems with limited learning spaces, supporting facilities, and access to the technology needed for the learning process (Ferri et al., 2020). This condition makes it difficult for students in these areas to access sustainability-based educational materials adequately, while schools in urban areas are relatively more prepared due to more complete facilities and infrastructure.

In addition to infrastructure factors, another challenge arises from the lack of integration of sustainable education into the curriculum. Although there are national policies that accommodate sustainability values, implementation in schools is often still partial and not integrated with core subjects. The current curriculum tends to emphasize the cognitive aspects of basic sciences rather than the interdisciplinary approach needed to teach sustainability issues. As a result, sustainable education is often positioned as additional material, not as a main framework in learning.

The readiness and capacity of teachers are also crucial factors in the successful implementation of ESD. Most primary school teachers have not received specific training on sustainability concepts, making it difficult for them to integrate these values into the learning process. Limited teacher training, a lack of contextual teaching materials, and limited funds for educator capacity building further worsen this situation (Wiggan et al., 2021). However, the success of sustainable education is highly dependent on the teacher's ability to deliver the material with a creative, relevant, and engaging approach for students.

Significant differences also exist between urban and rural schools. Urban schools generally have better facilities, adequate internet access, and teachers with higher quality education. In contrast, schools in rural areas often face limitations in facilities, difficult access to technology, and low socio-economic conditions of families, which prevent children from receiving full support to participate in sustainability-based learning. This inequality creates a gap in educational quality between regions, making the goal of equitable sustainable education difficult to achieve.

The urgency of research on sustainable education in primary schools lies in the fact that sustainability does not only concern environmental issues but also social and economic dimensions. By strengthening sustainability literacy early on, students can develop critical thinking skills, social sensitivity, and relevant life skills to face global challenges. However, without strong policies, funding support, and increased teacher capacity, ESD implementation will remain limited to discourse.

Based on this background, this article aims to examine the challenges in implementing sustainable education in Indonesian primary schools, analyze its implications for the quality of learning, and provide recommendations for solutions to improve the effectiveness of its application. With a literature review approach, this study is expected to provide academic and practical contributions in strengthening sustainable education strategies at the primary level, thus creating a generation that is more caring, critical, and ready to face the complexities of the future world.

## 2. Literature Review

Education for Sustainable Development (ESD) has been widely researched as a strategy to prepare young generations to face global challenges. UNESCO affirms that ESD is key to achieving the SDGs because it plays a role in instilling critical thinking, creativity, and social responsibility from an early age. This is in line with Masemene and Msezane (2021) view that primary education is a crucial phase in building the foundation of sustainability literacy because children at primary school age can more easily absorb values and attitudes of environmental care.

In the Indonesian context, several studies show that the implementation of ESD still faces serious obstacles. Mncube (2023) highlight the limited infrastructure of primary schools, especially in rural and remote areas, which has an impact on students' low access to learning facilities. Meanwhile, Yuliani et al. (2023) emphasize that the national curriculum still does not fully integrate sustainability values in an interdisciplinary manner, so learning tends to be partial and does not form a holistic understanding of global issues in students.

Teacher readiness is also a central issue in the implementation of sustainable education. Eliyawati et al. (2023) affirm that teachers have a strategic role as agents of change in education, but many primary school teachers have not received adequate training on the concept of sustainability. Newsome et al. (2023) adds that limited budget for training and updating teaching materials further worsens this condition. As a result, teachers have difficulty applying creative learning strategies that are relevant to environmental and social issues.

On the other hand, several studies highlight the differences in ESD implementation between urban and rural areas. Talan and Tyagi (2020) found that urban schools more easily adopt a sustainability-based curriculum because they have better access to technology and human resources. In contrast, rural schools face obstacles in the form of limited facilities, difficult internet access, and low family socio-economic backgrounds, which hinder student involvement in learning. These findings are reinforced by Verhelst et al. (2023) who states that without the support of facilities and a conducive learning environment, ESD integration only exists as discourse.

Nevertheless, the literature also emphasizes the great potential of ESD implementation. Hays and Reinders (2020) states that the integration of sustainable education into the formal curriculum can increase the relevance of learning for students. In addition, Sihombing et al. (2024) emphasize the importance of policy and funding support from the government to encourage the success of ESD equitably throughout Indonesia.

Thus, the literature review shows that sustainable education in Indonesian primary schools is in a strategic position but full of challenges. Limited infrastructure, sub-optimal curriculum integration, and a lack of teacher training are the main factors hindering implementation. On the other hand, if these challenges can be overcome through policy support, increased teacher capacity, and equitable resource distribution, then ESD has great potential in shaping a generation that cares about the environment, has critical thinking skills, and is able to actively participate in sustainable development.

## 3. Methods

This study uses the literature review method (library research) as its main approach. The literature review was chosen because the research objective is to examine the concepts, challenges, and implications of implementing education for sustainable development (ESD) in primary schools through an understanding of various relevant academic and policy literature. According to Zed (2014), library research is a method that focuses on collecting data and information from accountable written sources, whether in the form of books, journal articles, research

reports, or policy documents. The data collection process is carried out by examining literature so that this research remains relevant to the context of current educational policies, especially related to the implementation of the 2013 Curriculum, Merdeka Curriculum, and programs that support sustainable education such as Adiwiyata. The literature used includes the results of national and international studies that discuss ESD challenges, curriculum integration, teacher capacity, educational infrastructure, and differences in implementation between urban and rural areas.

The first stage of the research is identifying sources through academic databases  Google Scholar. After that, a selection is made with inclusion criteria, namely literature that discusses ESD, primary education, education policy, and sustainability issues. Sources that are irrelevant, non-academic opinion-based, or have no direct connection to primary education are excluded from the analysis. The second stage is thematic categorization. The collected literature is grouped into several main themes: limited infrastructure, curriculum integration, teacher capacity, policy support, and implications for learning quality. This categorization process helps in organizing data and arranging the discussion flow to be systematic.

The third stage is content analysis. The analysis is carried out by comparing findings between studies, identifying research gaps, and formulating general conclusions regarding the condition of sustainable education implementation in Indonesian primary schools. This analysis also includes a synthesis of information from various sources to produce an in-depth interpretation. To ensure validity, this study uses a source triangulation technique, which is comparing data from national and international literature, as well as official reports from educational institutions.

In this way, the results of the analysis not only describe the specific conditions of Indonesia but also connect global practices in sustainable education. Thus, this literature review method allows the research to provide a comprehensive understanding of the challenges, implications, and solutions for ESD implementation in Indonesian primary schools without conducting field data collection, but still based on credible academic sources.

## 4. Results and Discussion

### 4.1 Challenges of Implementing Sustainable Education in Primary Schools

The results of the literature review show that the main challenges in implementing education for sustainable development (ESD) in Indonesian primary schools are very complex, covering aspects of infrastructure, curriculum, human resources, and policy. This complexity shows that sustainable education cannot be separated from the social, economic, and political context that influences the world of education. First, limited infrastructure is the most highlighted problem. Many primary schools, especially in rural and remote areas, still lack basic facilities such as decent classrooms, libraries, laboratories, and access to technology. Mncube (2023) affirm that this infrastructure gap causes students in rural areas to not experience the same learning experience as those in urban areas.

In fact, ESD integration requires adequate learning media, for example, access to digital learning resources, environmental management practices, or experiential conservation-based activities. The absence of facilities often limits sustainability learning to theory, without real-world experience that encourages student awareness.

Second, ESD curriculum integration still faces serious obstacles. Yuliani et al. (2023) show that despite efforts to include sustainability topics in the national curriculum, such as the 2013 Curriculum and the Merdeka Curriculum, its application at the school level is still partial. The curriculum tends to focus more on achieving basic academic competencies (literacy and numeracy), while sustainability issues are considered an addition. This is different from the interdisciplinary approach promoted by UNESCO, which emphasizes the importance of integrating environmental, social, and economic aspects into all subjects.

Third, limited teacher competence and training is the next challenge. Teachers as the front line of curriculum implementation often do not have a deep understanding of sustainability concepts. Eliyawati et al. (2023) underscore that a lack of relevant training makes it difficult for many teachers to design creative learning strategies. In addition, Newsome et al. (2025) emphasizes that the allocation of funds for teacher capacity building is still very limited, so teacher professionalism development cannot be sustainable. This situation hinders the transformation of learning that emphasizes solving real problems related to global issues, such as climate change or social inequality.

Fourth, policy support is still not optimal. Although the government has initiated various environmental education programs such as Adiwiyata, broader policy support for ESD integration in primary education is still limited. Sihombing et al. (2024) remind that education policies are often general and lack clear technical guidelines. As a result, schools do not have concrete guidelines on how to integrate

sustainability into the curriculum. In addition, funding for sustainability programs is still minimal, so implementation in schools is highly dependent on local initiatives. Challenges are also seen in the disparity between urban and rural areas. Talan and Tyagi. (2020) show that schools in urban areas have better access to human resources and technology, making it easier to adopt sustainability-based programs. In contrast, schools in rural areas often face obstacles in the form of limited internet access, low quality of teachers, and socio-economic conditions of students' families that make education not a top priority. This difference creates a significant gap in ESD implementation, even though the main goal of sustainable education is the equitable distribution of inclusive learning opportunities.

Thus, the literature findings show that the challenges of implementing sustainable education in Indonesian primary schools are multidimensional. It does not only concern technical factors such as infrastructure and funding but also structural factors such as teacher readiness, policy, and inter-regional disparities. These challenges need to be analyzed further so that strategic solutions can be found, because without targeted intervention, sustainable education in primary schools will be difficult to achieve its ideal goals.

## 4.2 Implications of Sustainable Education on Learning Quality in Primary Schools

Despite facing many challenges, the implementation of sustainable education in primary schools has very significant implications for the quality of learning and student development. The literature shows that ESD is not just an environmental issue, but is also closely related to the cognitive, affective, and social aspects of

students which ultimately improve the quality of education holistically. First, ESD contributes to the development of critical thinking skills. According to Tilbury (2020), sustainability-based learning requires students to analyze global issues such as climate change, poverty, and social inequality, and then find creative solutions. Thus, students are trained to think systematically and consider the interrelationship between environmental, social, and economic factors. In the context of primary schools, this is very important because it accustoms children to not only memorize material but also connect it with daily life.

Second, sustainable education plays an important role in the formation of social character and concern for global issues. Verhelst et al. (2023) shows that students involved in sustainability-based learning tend to have higher social awareness, care more about the environment, and are better able to work together in facing collective challenges. Values such as responsibility, solidarity, and caring become an integral part of the learning process. This is in line with the goals of Indonesian national education which emphasize character building in addition to academic mastery.

Third, ESD integration increases curriculum relevance. By including real issues such as pollution, renewable energy, or waste management into learning, students can see the direct relationship between school material and the reality of life. Talan and Tyagi (2020) affirm that relevant learning increases student motivation to learn and encourages active involvement in the educational process. Thus, the curriculum is not just a collection of materials but also a bridge to connect students with the world outside of school. Fourth, ESD has the potential to reduce social

inequality through inclusive education. Sihombing et al. (2024) state that sustainable education provides opportunities for students from various socio-economic backgrounds to understand the importance of sustainability. With the right policy support, ESD can be a means to empower rural communities to care more about the environment and participate in local development.

Another implication is the development of 21st-century skills. UNESCO (2021) emphasizes that sustainable education hones collaboration, communication, creativity, and digital literacy skills. Students do not only learn about sustainability theoretically but are also invited to develop applicable projects. For example, waste management at school, creating a school garden, or using alternative energy. These activities not only add knowledge but also train practical skills that are useful in the future. With all these implications, it is clear that sustainable education has a significant impact on improving the quality of learning in primary schools. However, the success of implementation is highly dependent on the support of the entire education system, including policies, funding, and teacher training. If the challenges that have been identified can be overcome, then ESD has great potential to become an important foundation for the transformation of primary education in Indonesia towards a more inclusive, relevant, and sustainable direction.

## 5. Conclusion

Sustainable education in primary schools has a fundamental role as a foundation in shaping a generation that cares about the environment, is critical of global issues, and is responsible for the future. The results of the literature review

show that the implementation of Education for Sustainable Development (ESD) in Indonesia still faces various obstacles, ranging from limited infrastructure, unequal access to technology, a lack of teacher competence, to inconsistent policy support. These challenges become more apparent when comparing the conditions of schools in urban areas that have relatively adequate resources with schools in rural and remote areas that are still struggling with limited facilities and the socio-economic conditions of students' families.

However, despite the many obstacles, sustainable education has very positive implications for the quality of learning. ESD integration can foster critical thinking skills, strengthen social character, increase the relevance of the curriculum to real life, and develop 21st-century skills. In addition, ESD has the potential to reduce social inequality by providing an inclusive understanding of sustainability for all students, regardless of their socio-economic background.

Therefore, the success of ESD is highly dependent on more concrete policy support, continuous teacher capacity building, and equitable distribution of educational infrastructure. If these obstacles can be overcome, then primary education in Indonesia will be able to transform into a learning space that is relevant, inspiring, and oriented towards sustainable development. Ultimately, sustainable education is not just about teaching environmental concepts, but also about shaping the mindset and attitudes of a generation that is ready to face global challenges in the future.

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