



Collaborative governance in environmental education: Systematic literature review on enhancing school-community partnerships for sustainable development

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ABSTRACT

Background: The framework of Collaborative Governance in Environmental Education (EE) has gained increasing attention in recent years, especially in the context of sustainable development. However, the literature on this topic is still limited, so a deep understanding of how school-community partnerships can improve the effectiveness of EE programs has not been fully explained. This study aims to explore the dynamics of Collaborative Governance between schools and communities by identifying the challenges, strategies, and key outcomes that contribute to sustainable environmental education practices. **Method:** This study uses a Systematic Literature Review (SLR) by synthesizing empirical and conceptual findings from five relevant journal articles published between 2019 and 2025 through the Scopus database. **Finding:** The results of the analysis show that collaboration between schools, local governments, and civil society organizations plays an important role in fostering a culture of sustainability in the educational environment. The findings also revealed that although collaborative efforts can strengthen trust-building, joint decision-making, and mutual accountability, their implementation is still constrained by limited resources, weak coordination, and suboptimal policy support. Furthermore, this study emphasizes the importance of institutional commitment and continuous professional development for educators to maintain the sustainability of EE programs. **Conclusion:** The results of this study are consistent with the theory of Collaborative Governance, which emphasizes interdependence and shared responsibility among stakeholders in creating public value. This study concludes that Collaborative Governance functions not only as a coordination mechanism, but also as a transformative process that builds collective trust and empowers schools as agents of sustainable change. **Novelty/Originality of this article:** This study contributes through a systematic mapping of the intersection between Collaborative Governance and Environmental Education and offers integrative conceptual insights that support the development of a Collaborative Environmental Education Framework that is aligned with Sustainable Development Goals (SDGs) points 4 and 13.

KEYWORDS: collaborative governance; environmental education; sustainable development.

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1. Introduction

Global environmental challenges such as climate change, pollution, and ecosystem degradation now pose a serious threat to the sustainability of the planet and human well-being. The IPCC (Intergovernmental Panel on Climate Change) report confirms that climate change exacerbates environmental damage and threatens ecosystems globally, requiring immediate coordinated action across various sectors (Greer et al., 2023). The Earth Summit Agenda 21 highlights the importance of education as a key instrument in achieving sustainable development through raising awareness and changing people's behavior towards the environment (Velasco Martínez et al., 2020). In line with this, the Tbilisi Declaration emphasizes that Environmental Education (EE) not only serves to raise awareness, but also empowers individuals to take concrete and responsible action towards environmental conservation, especially in schools (Nepraš et al., 2023). Other studies also show that effective environmental education can change consumption patterns, reinforce sustainability values, and encourage active community participation in mitigating ecological crises (Damoah, 2023; Fox & Thomas, 2022). However, global environmental challenges are also inseparable from issues of environmental equity, where marginalized communities often bear disproportionate environmental burdens. Strengthening EE therefore requires linking sustainability values with social justice principles to ensure that environmental learning addresses inequality and promotes fair access to environmental benefits (Miles et al., 2025).

For now, Environmental Education (EE) is recognized as important for shaping students' awareness and sustainable behavior. However, its implementation in educational institutions in Indonesia still faces various serious obstacles. Many schools do not yet have an environment-oriented vision and mission, and do not sufficiently integrate green activities into the curriculum, so that environmental education is often considered merely an additional activity (Dagamac & Darmawan, 2021). Teachers' low commitment to implementing EE is influenced by emotional exhaustion due to high workloads and administrative demands. On the other hand, most teachers still view EE as an additional task outside their subject matter expertise (Asaloei et al., 2020; Wullur & Werang, 2020). In addition, weak educational policy support and frequent curriculum changes have resulted in EE lacking clear and structured implementation guidelines at various levels of education (Prihantoro, 2014). The lack of community participation and minimal collaboration between schools and local communities further undermines the effectiveness of EE programs, as educational efforts are not balanced with sustained social involvement from external parties (Dagamac & Darmawan, 2021). As a result, environmental education in Indonesia is still being implemented partially and has not yet become an integral part of the national education system. These structural challenges also reinforce social disparities, as schools with fewer resources tend to have weaker EE programs, further widening gaps in environmental awareness and access to ecological learning opportunities (Chao, 2024).

Collaboration between schools, teachers, government, and the community is central to creating a sustainable education ecosystem that is responsive to environmental challenges. Schools play a strategic role as centers of change, while teachers are the main drivers in instilling environmental values and awareness in students (Libelo & Tracy, 2022; Pringadi et al., 2023). However, these efforts will be more effective if supported by government policies that favor the integration of environmental education into the curriculum and ongoing teacher training (Greer et al., 2023; Velasco Martínez et al., 2020). The government has a responsibility to provide an adaptive policy framework and a participatory space for the community to be involved in developing school-based environmental programs. On the other hand, local community participation strengthens the learning process through direct experience and action-based activities, such as greening projects or environmental cleanliness campaigns (Velasco Martínez et al., 2020). Thus, synergy between educational institutions, public policy, and community involvement can create an education system that is not only academically oriented, but also sustainable and environmentally friendly. Integrating principles of environmental citizenship is essential in this synergy, as it

encourages learners to develop civic responsibility toward environmental stewardship. Similarly, climate governance education provides students with an understanding of how decision-making processes shape climate outcomes, while participatory environmental policy frameworks ensure that communities have a voice in ecological governance (Ariza et al., 2021).

The theory of Collaborative Governance introduced by Ansell & Gash (2008) provides a deep understanding of how various government actors, educational institutions, communities, and the private sector can work together effectively to achieve common goals through participatory and dialogical processes. This model emphasizes the importance of trust building, joint goal setting, and stakeholder engagement as key elements for successful collaboration. Then Emerson & Nabatchi (2015) expand this framework by emphasizing that effective collaboration must be directed towards creating public value and sustainability, where the results of cross-actor cooperation not only provide administrative benefits but also have a direct impact on community welfare and environmental sustainability. When integrated into EE, Collaborative Governance offers a pathway to address inequities by ensuring that marginalized groups are involved in environmental decision-making, thus reinforcing fairness and inclusion within educational and ecological systems.

In the context of EE, this theory is particularly relevant because it places collaboration at the heart of the sustainable education process. The implementation of EE cannot be effective if carried out by one party alone. Instead, the active involvement of teachers, government, and local communities is needed to create an educational ecosystem that supports environmental awareness (Velasco Martínez et al., 2020). Through the application of collaborative governance principles, schools can partner with non-governmental organizations to develop environment-based activities, build a shared commitment to nature conservation, and foster a culture of eco-consciousness among students (Damoah, 2023; Libelo & Tracy, 2022). Thus, this theory is not only a conceptual framework, but also a strategic approach to strengthening school-community synergy in realizing transformative and sustainable environmental education. This collaborative approach aligns with participatory environmental governance frameworks that aim to enhance democratic engagement and collective responsibility in addressing ecological challenges. Such frameworks emphasize inclusive deliberation, shared decision-making, and social learning processes, which can improve the legitimacy and effectiveness of environmental problem-solving when properly institutionalized (Ansell & Gash, 2008; Emerson & Nabatchi, 2015; Newig et al., 2018).

Previous research on EE has generally focused on its impact on individual behavior without further examining the collaborative mechanisms that support program sustainability. Studies by Roswita (2020) show that the Adiwiyata program-based school management model can create a conservation-oriented learning environment, but its effectiveness depends on the involvement of various parties in its implementation. A similar finding was revealed by Herliana & Suriansyah (2025), which confirms that environmental education can change consumption patterns and behavior, but structural support is needed for the effects to be long-term. Meanwhile, research Dagamac & Darmawan (2021) highlights the weak integration of EE in schools due to a lack of collaboration between teachers, schools, and local communities. Despite these insights, few studies explore how collaborative mechanisms can reduce social and environmental inequities within school communities, indicating an important gap that this study seeks to address. Based on these findings, there is still a research gap regarding how collaboration can play a role in strengthening EE implementation. Therefore, this study aims to conduct a Systematic Literature Review (SLR) to identify patterns, obstacles, and collaborative strategies between schools and communities in the implementation of environmental education towards sustainable development.

2. Methods

This study uses the Systematic Literature Review (SLR) method to comprehensively examine the practice of Collaborative Governance in Environmental Education (EE) towards sustainable development in Indonesia. The SLR approach allows researchers to synthesize various studies to identify theoretical and practical insights in a particular field of study (Mukherjee et al., 2023). This SLR study was conducted by reviewing various studies discussing cooperation between schools and communities. The aim was to understand the challenges and obstacles and to find strategies that could be used to strengthen EE through collaborative governance. The literature search strategy was carried out using the Scopus database, which is widely recognized for its comprehensive bibliographic coverage and reliability in academic research (Harzing & Alakangas, 2016; Pranckutė, 2021).

This Systematic Literature Review approach was conducted comprehensively to ensure the representation of various research perspectives relevant to the theme of school and community collaboration in EE implementation. The systematic approach was designed so that the analysis was not only descriptive but also able to map the diversity of theories, methodologies, and research focuses as suggested by Carrera-Rivera et al. (2022). The literature search was conducted using the Scopus database with the keywords: ("collaboration" OR "collaborative governance" OR "stakeholder collaboration") AND (school OR "formal education") AND ("environmental education" OR ESD OR "sustainable development"). The initial search yielded 668 documents. After filtering based on the 2019–2025-time frame, the number narrowed down to 362 documents, focusing on the latest research over the last ± 5 years. Next, a search was filtered by the fields of Social Sciences and Environmental Sciences, finding 253 thematically relevant documents. Then, the filtering process was carried out by selecting scientific articles/journal documents, resulting in 171 documents, which showed the dominance of empirical and conceptual publications in this area. Finally, filtering based on Indonesia as the country of origin yielded only 6 documents, while the other 160 documents came from other countries and one document was from a review proceeding, indicating that research on collaborative governance in the context of formal environmental education in Indonesia is still relatively limited and offers great opportunities for further academic contributions (Figure 1).

Additional procedural steps were incorporated. First, the six Indonesia-related documents were screened using predefined inclusion and exclusion criteria covering relevance to collaborative governance, empirical depth, methodological clarity, and explicit linkage to EE or ESD. Second, each article was assessed using a structured appraisal tool adapted from PRISMA and SLR quality indicators (Page et al., 2021), which includes evaluation of research design, data credibility, transparency of reporting, contextual relevance, and theoretical alignment. Third, cross-validation was conducted by two independent reviewers to minimize subjective bias and ensure consistency in article selection and coding. Through this multi-stage screening, only five studies met all inclusion criteria. The rationale for retaining five articles is not based on convenience but on methodological necessity: these five articles are the only ones that directly operationalize collaborative governance within formal school-based environmental education in the Indonesian context; they provide sufficient depth for cross-case comparison; and expanding to international articles would risk reducing contextual relevance, as governance structures differ significantly across countries. This justification aligns with SLR principles that prioritize conceptual fit and methodological transparency over quantity.

Literature analysis shows several key findings related to collaborative initiatives in EE implementation. One important finding is that Collaborative Governance improves EE effectiveness by encouraging active participation among stakeholders such as schools, local communities, and government agencies (Ansell & Gash, 2008; Emerson & Nabatchi, 2015). In addition, the literature emphasizes the importance of shared leadership, communication, and capacity building in maintaining the long-term sustainability of environmental education outcomes. Furthermore, this review also shows that there is still a lack of

empirical research exploring how Collaborative Governance mechanisms are applied in school-based environmental education programs, especially in developing countries (Al-Balushi et al., 2022; Mochizuki & Bryan, 2015). Therefore, further empirical research is needed to understand how schools and communities interpret and practice Collaborative Governance in the context of Education for Sustainable Development (ESD). Keywords such as collaboration, stakeholder governance, and environmental education provide a broad yet focused scope of study, enabling a comprehensive review of this topic.

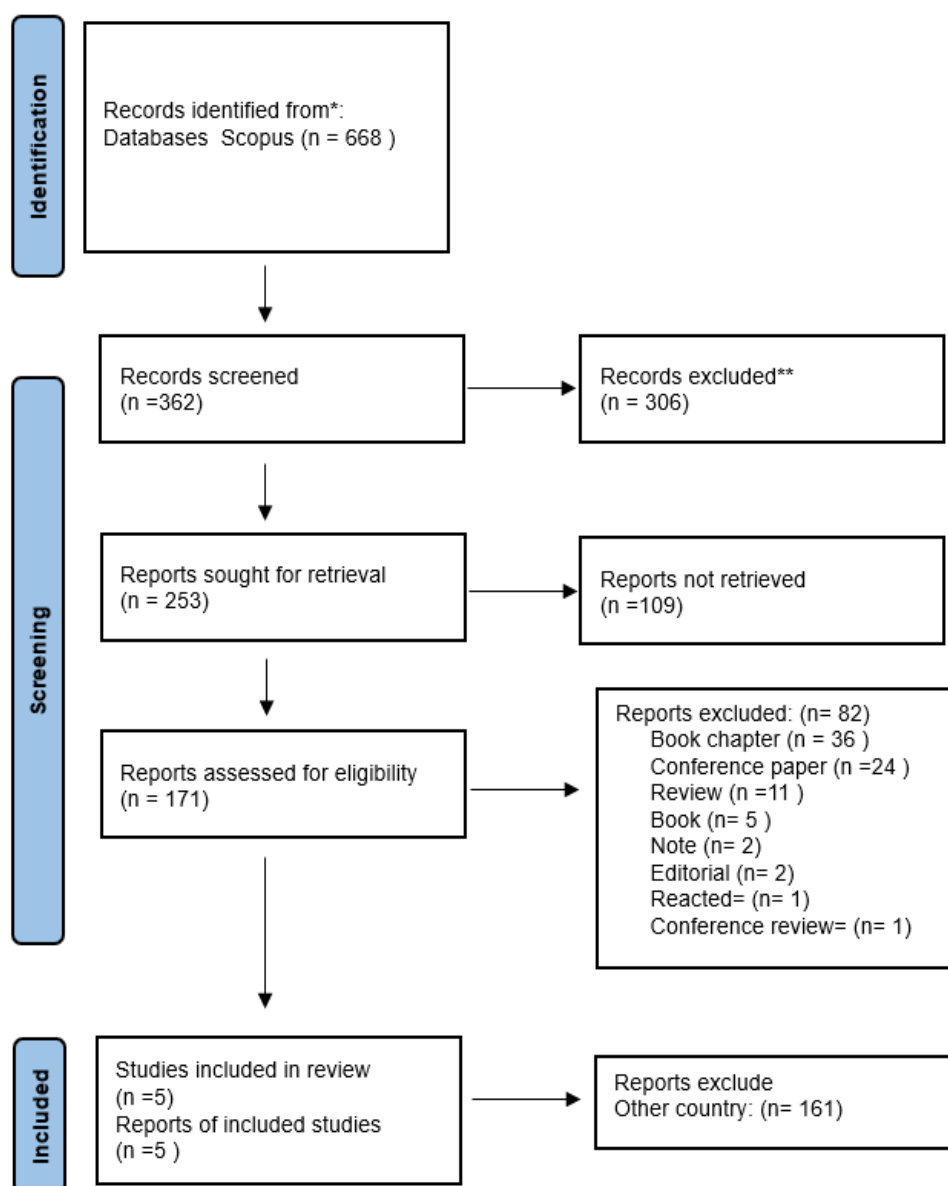


Fig. 1. Prisma flowchart of identification and selected studies

The data extraction and analysis process was carried out following the PRISMA guidelines for systematic reviews (Page et al., 2021), to ensure accuracy, transparency, and consistency throughout all stages of the research. The evaluation of selected studies considered aspects of validity, reflexivity, relevance, and reporting quality to improve the credibility and reliability of the results. Several researchers were involved in the validation and synthesis of findings to ensure objectivity and minimize bias. The evaluation results show that Collaborative Governance is a key factor in integrating sustainability values into formal education and strengthening partnerships between schools and communities in achieving sustainable development goals (UNESCO, 2021; Wals & Benavot, 2017). The database filtering process is explained in Figure 1 above.

3. Results and Discussion

This study seeks to answer the main question: How does the mechanism of Collaborative Governance between schools and communities influence the implementation of Environmental Education (EE) towards sustainable development? The results of the literature review show that collaboration among stakeholders, especially between schools, teachers, government, and local communities, plays an important role in strengthening the effectiveness of environmental education through action-based partnerships, participatory communication, and community-based contextual learning. Collaborative Governance has been proven to increase shared commitment to sustainability, strengthen trust between actors, and encourage the formation of public value that supports the creation of an environmentally friendly education ecosystem. However, the study also identified a number of obstacles, such as limited resources, low coordination capacity, and weak policy support, which hinder optimal collaborative implementation (Ansell & Gash, 2008; Emerson & Nabatchi, 2015). These findings confirm that the success of environmental education is largely determined by the sustainability of collaboration and strong support among stakeholders. The summary of the research results discussed in this report is supported by a comprehensive analysis of various studies on the impact of collaboration on the implementation of environmental education, as shown in Table 1 below. Full these articles from Scopus are described in detail Appendix 1.

Table 1. Literature list

Author	Year	Publisher	Index
Roswita	2019	Journal of Management Development	Q1
Prasetyo et al.	2020	Issues in Educational Research	Q1
Rosita & Kurniatun	2025	Educational Process: International Journal	Q2
Husin et al.	2025	Discover Sustainability	Q1
Herliana et al.	2025	Issues in Educational Research	Q2

3.1 Form of collaboration

Various studies show that collaboration is at the heart of successful environmental education programs. Prasetyo et al. (2020) emphasizes that “effective collaboration between schools, communities, and governments is key to the implementation of the Adiwiyata program, which includes joint activities such as tree planting, waste management, and environmental awareness campaigns.” This statement emphasizes that collaboration is not limited to interactions between teachers and students, but also involves parents, local communities, and local governments in creating a clean, healthy, and sustainable school environment. Husin et al. (2025) emphasizes that partnerships with various external institutions such as environmental agencies, environmental communities, and universities enrich the school's capacity to implement ecological education. These forms of collaboration are reflected in training activities, seminars, technical assistance, and environmental competitions involving various related parties. Thus, it can be concluded that harmonious, structured, and sustainable collaboration between schools, government, communities, and external institutions is the main foundation for realizing effective ecological education. These collective efforts not only strengthen program implementation but also instill values of environmental awareness in the entire school community and the surrounding community. Moreover, collaborative arrangements expand opportunities for schools with limited resources to access environmental programs, thereby reducing gaps in environmental learning across different social and economic groups. Such collaborative networks contribute to greater environmental equity by ensuring that sustainability education is not concentrated only in well-resourced schools.

3.2 *Involved actors*

In the implementation of environmental education (EE) programs, schools are the main actors responsible for carrying out various ecologically minded activities. Principals, teachers, and students have strategic roles in building a school culture that cares about the environment. Prasetyo et al. (2020) emphasizes that the principal acts as the driving force and main motivator in building a culture of environmental awareness in schools. At the same time, teachers and students play an active role through waste management activities, tree planting, and environmental awareness campaigns, which are an integral part of the program's implementation.

In addition to the internal role of the school, external support also contributes to the success of the program. Then Rosita & Kurniatun (2025) stating that partnerships with external institutions such as the environmental agency and environmentalist communities are crucial in providing training, resources, and other support. Local governments play a role in providing policy and regulatory frameworks, while non-governmental organizations (NGOs) and local communities provide support through program assistance, activity facilitation, and school capacity building. This cross-actor collaboration enables various environmental initiatives to be implemented more effectively, systematically, and sustainably.

The participation of parents and the community is also an important element in ensuring the sustainability of environmental education programs. As stated in Husin et al. (2025), parents and the community play an active role in supporting school activities, such as participating in late-night education and mutual assistance activities. This community involvement expands the impact of the program not only within the school environment, but also in the wider social sphere. Thus, synergy between internal actors such as school principals, teachers, and students and external factors such as the government, NGOs, communities, and parents is an important foundation for realizing effective environmental education implementation. Structured, participatory, and sustainable collaboration is believed to be able to instill environmental values in the younger generation and strengthen ecological awareness in the community. Importantly, these multi-actor collaborations can also mitigate social inequalities by ensuring that marginalized groups such as low-income students or isolated rural communities gain equal access to environmental learning opportunities and resources. This reflects the principle of environmental equity highlighted in contemporary environmental governance debates

3.3 *Supporting and inhibiting factors*

The main supporting factors in the successful implementation of ecological education are collaborative leadership, effective communication, and the building of trust between the actors involved. According to Herliana & Suriansyah (2025), leadership that brings all stakeholders together and fosters open communication can increase the success of environmental education programs. Inclusive and collaborative leadership can strengthen the synergy between schools, government, and the community, thereby supporting the achievement of ecological education goals more effectively.

Policy support and resources from the government are also key factors that support the sustainability of the program. Leadership that brings all stakeholders together and fosters open communication can increase the success of environmental education programs. Inclusive and collaborative leadership can strengthen the synergy between schools, government, and the community, thereby supporting the achievement of ecological education goals more effectively.

Policy support and resources from the government are also key factors that support program sustainability. In Herliana & Suriansyah (2025), it is mentioned that clear policy support and adequate resource allocation from the central and local governments are very important in supporting school activities in implementing environmental education programs. These supportive policies provide legitimacy and facilitate systematic program

implementation, as well as ensuring the availability of funds and facilities necessary for the success of the activities.

However, on the other hand, there are various inhibiting factors that hinder the successful implementation of the program. One of them is sectoral ego and lack of coordination between actors, which causes overlapping policies and activities. In Johanis Rumambi (2024) it is mentioned that sectoral ego and lack of coordination exacerbate obstacles in program implementation, as each party tends to focus on its own authority without regard for sustainability and synergy between sectors. In addition, limited funds and a lack of teacher competence in environmental pedagogy are significant challenges that must be overcome for the program to run optimally. As another inhibiting factor, the lack of teacher competence and limited funds also affects the effectiveness of program implementation. In Prasetyo et al. (2020) it is mentioned that teachers' lack of competence in environmental pedagogy and limited operational funds often hinder the success of ecological education in schools. As a result, teacher training and capacity building are important areas that must be improved so that teachers are able to implement innovative learning that touches on ecological aspects in a real and sustainable manner. These disparities in school capacity also illustrate existing inequities in environmental education delivery. Collaborative governance models can help reduce these gaps by distributing resources, expertise, and support systems more fairly across schools with different socio-economic conditions.

3.4 Impact of collaboration

Based on an analysis of the impact of collaboration in environmental education programs in the form of the Adiwiyata program, it appears that collaboration between various actors, such as schools, government, NGOs, and the community has a significant positive impact on the success of the program. An example of implementation at SMPN 1 Kotabaru, for instance, is the collaboration between the principal, teachers, students, and parents, which has proven effective in waste management, achieving a 75% reduction in plastic waste and success in managing waste banks and compost production. This shows that collaboration between green leadership and active participation from the school community is crucial to the success of the program (Herliana & Suriansyah, 2025).

Another positive impact of this collaboration is increased environmental awareness among students and teachers. Through involvement in various environmental activities, students not only learn about the importance of protecting the environment but also develop a sense of responsibility for sustainability. As stated by a teacher at SMPN 1 Kotabaru as follows.

"Students' awareness of the importance of protecting the environment has increased after involving them in environmental activities" (Herliana & Suriansyah, 2025).

This shows that good collaboration can create positive behavioral change within the school community. Beyond behavioral change, collaborative governance also strengthens social inclusion by involving diverse stakeholders' students, parents, and local communities in shared environmental action. This inclusive structure promotes environmental justice by allowing voices from different socio-economic backgrounds to shape environmental initiatives in schools.

However, to optimize the implementation of environmental education in the form of the Adiwiyata program, several suggestions need to be considered. First, it is important to improve training for school leaders so that they can understand sustainability issues and how to implement them in the school context. As stated by Arici & Uysal (2022), The importance of green leadership shows that leaders in the education sector need to be trained to understand sustainability issues. Second, strengthening team synergy among all elements in the school is also key to the program's success. Collaboration between teachers, students, parents, and the surrounding community can increase the effectiveness of

environmental activities. Strong collaborative structures provide a platform for ensuring that program benefits are distributed equitably, thereby preventing disparities in environmental knowledge and engagement between privileged and underserved school communities.

3.5 Theoretical implications

The findings confirm that the success of environmental education (EE) is highly dependent on the strength of cross-sector collaboration as described in the theory of Collaborative Governance (Ansell & Gash, 2008). Synergy between the government, educational institutions, and the community forms a governance mechanism that enables the exchange of knowledge, resources, and shared responsibility for environmental issues. In line with Heilmayr & Lambin (2016), multi-stakeholder collaboration can improve environmental performance through effective coordination and shared legitimacy. Nurani & Wike (2021) adding that the involvement of various non-governmental actors broadens the scope of policies and ensures that programs are tailored to the needs of local communities, while Darumurti (2022) emphasizing the importance of the role of NGOs in maintaining diversity of perspectives so that environmental policies are not solely top-down.

In the empirical context of Indonesia, this collaborative principle is clearly evident in the Adiwiyata program, where cooperation between schools, government, and local communities has succeeded in creating a culture of sustainable environmental awareness. Herliana & Suriansyah (2025) noting that this collaboration has reduced plastic use by up to 75%, proving that active participation by all parties not only strengthens policy but also changes behavior. These results are in line with findings Kim (2016) and Kraft & Wolf, (2016), which emphasizes that trust and transparency among stakeholders are the foundation of successful Collaborative Governance. Through an equal participatory process, each actor has the space to contribute, generate innovation, and strengthen their sense of ownership of the environmental programs being implemented.

This pattern of collaboration is similar to disaster management mechanisms, where success also depends on cross-sectoral involvement. Gani et al. (2023) found that synergy between the government, educational institutions, and NGOs in disaster education in Aceh was able to strengthen community preparedness, an important lesson for environmental education strategies. The principles of cooperation and collective responsibility were identified by Darmasetiawan & Santoso (2022) and Samanlangi et al. (2024) which shows that cross-actor collaboration produces adaptive solutions to complex challenges. Thus, Collaborative Governance is not merely a coordination tool, but a transformational process that builds social capacity, strengthens trust, and revives the spirit of mutual cooperation in realizing sustainable environmental education. These findings reaffirm that collaborative governance can advance environmental equity by promoting inclusive participation, redistributing decision-making power, and enhancing resource accessibility across socially diverse school communities.

The collaboration model proposed by Emerson & Gerlak (2014) expanding ideas Ansell & Gash (2008) by highlighting three important pillars in Collaborative Governance, namely trust-building, joint decision-making, and mutual accountability. These three pillars create a dynamic interaction that ensures that each actor is not only formally involved but also has a substantive commitment to common goals. Trust-building is a key prerequisite in creating a space for open dialogue that respects differences of opinion, as expressed by Esteban (2020) that trust is the foundation of resilient and adaptive collaboration. Meanwhile, joint decision-making enables more inclusive decision-making through consensus mechanisms, which, according to Kagungan et al. (2021) strengthen the sense of ownership among actors towards the results achieved.

In the context of environmental education, these three principles are not only normative but also operational. The application of joint decision-making, for example, can be seen in school initiatives that involve students in designing recycling and greening

projects, so that students become a direct part of environmental solutions. Such activities create social learning that reinforces the value of collective responsibility, in line with the idea of Grüb & Martin (2018) that open communication between actors encourages innovation in governance networks. On the other hand, trust-building acts as social energy that maintains the sustainability of collaboration, because without mutual trust, commitment to common goals will easily become fragile and merely symbolic.

The final aspect, mutual accountability, ensures that each party bears moral and institutional responsibility for its role in the collaborative process. Emerson et al. (2012) emphasizes that mutual accountability strengthens the legitimacy and effectiveness of policies, especially in the context of complex environmental issues. Fitriati & Nuralam (2019) adding that joint evaluation mechanisms can increase transparency while building a sense of shared responsibility among actors. Thus, the combination of trust-building, joint decision-making, and mutual accountability creates Collaborative Governance that is not only administratively effective, but also transformative in building shared awareness and commitment to environmental sustainability. When applied in educational contexts, this governance model helps reduce social disparities by ensuring that environmental learning is inclusive, participatory, and sensitive to the needs of disadvantaged groups.

3.6 Practical implications

The implementation of collaborative governance-based environmental education emphasizes the importance of schools developing strong internal policies related to green vision. These policies include a commitment to incorporating sustainability principles into the curriculum, extracurricular activities, and daily practices in the school environment (Rahmayanti et al., 2021; Soriano et al., 2024). In addition, schools can establish strategic partnerships with various parties, such as NGOs, the private sector, and local communities, to demonstrate the practical application of green practices (Kagungan et al., 2021; Nugraha et al., 2025). These steps not only foster a culture of environmental awareness among students and teachers, but also make schools active agents of change in their communities (Heilmayr & Lambin, 2016; Soriano et al., 2024).

The development of partnership programs between schools and external parties has proven effective in increasing environmental capacity and awareness. This collaboration can include teacher training, community-based projects, and the exchange of information on environmental sustainability (Asaduzzaman & Virtanen, 2020). Studies show that active school involvement in joint community projects can strengthen the participation of students, parents, and the community, thereby broadening and sustaining the impact of environmental education (Mammadova et al., 2022). Thus, this partnership is not merely a formal program, but a means of building collective responsibility for environmental issues (Esteban, 2020; Kim, 2016).

In addition to internal school initiatives, the role of local government is crucial in facilitating collaboration between schools and communities. The government can provide guidance, resources, and dialogue platforms to support community-based projects (Fitriati & Nuralam, 2019; Nurani & Wike, 2021). For example, waste management programs, tree planting, and cleanliness campaigns involving students, teachers, and local communities show that government support strengthens the community's sense of ownership and responsibility for the environment (Darmasetiawan & Santoso, 2022). Through structured collaboration, local governments not only assist schools in environmental education, but also strengthen community resilience to disasters and environmental change.

Overall, the integration of internal school policies, the development of partnership programs, and facilitation by local governments form an effective practical foundation for environmental education. This approach enables schools to function as comprehensive centers of environmental learning, while promoting active community participation in risk mitigation and sustainable development (Nugraha et al., 2025; Rahmayanti et al., 2021). With this collaborative strategy, environmental education can have a real impact on students, schools, and the wider community. Practically, this also contributes to reducing

inequities between schools by enabling those with fewer resources to benefit from shared programs, cross-institutional partnerships, and community-supported initiatives that enhance their environmental education capacity.

3.1 Challenges and recommendations

One of the main challenges in implementing environmental education is the lack of environmental awareness in schools. Many schools have not prioritized sustainability, as reflected in the limited green open spaces, lack of integration of environmental education in the curriculum, and minimal community-based activities (Husin et al., 2025; Rosita & Kurniatun, 2025). The lack of understanding among teachers and school staff regarding the importance of environmental education also contributes to this low level of awareness (Herliana & Suriansyah, 2025; Rahmayanti et al., 2021). This shows the need for a more systematic approach to instilling environmental values in schools as part of institutional culture (Soriano et al., 2024).

In addition, limited resources are a significant obstacle to the implementation of EE programs. Many schools face financial and infrastructure constraints that limit their ability to implement community-based projects or effective environmental learning activities (Rosita & Kurniatun, 2025). These limitations also result in a lack of technology and monitoring tools that can be used to evaluate programs (Ibrahim et al., 2023). In this context, support from local governments and external parties such as NGOs and the private sector is important to provide the necessary resources, training, and technology (Mammadova et al., 2022).

Low stakeholder participation is also a challenge in environmental education. The involvement of parents, communities, and external stakeholders in school programs is still minimal, limiting the impact of environmental education initiatives (Herliana & Suriansyah, 2025). This can hinder the creation of effective community-based projects, as collaboration between actors is essential to raising awareness and collective responsibility for the environment (Asaduzzaman & Virtanen, 2020). Therefore, strategies to increase stakeholder engagement, such as community forums, participatory workshops, and collaborative activities in schools, are necessary steps that need to be implemented (Muryani et al., 2022).

To overcome these challenges, several practical recommendations can be implemented. First, schools need to develop clear internal policies regarding green vision and partnership programs, so that environmental education becomes an integrated part of the school culture (Herliana & Suriansyah, 2025; Rahmayanti et al., 2021). Second, ongoing training for teachers is essential to equip them with the knowledge and skills to teach EE effectively (Husin et al., 2025). Third, providing incentives for schools that actively collaborate with the community can encourage the development of innovative and sustainable programs (Irwansyah et al., 2023).

In addition, a regular monitoring and evaluation system needs to be implemented to assess the sustainability of environmental education programs. This system should include collaborative evaluation between schools, teachers, and communities, so that accountability and transparency can be maintained (Kraft & Wolf, 2016; Nankya et al., 2025). The use of digital technology to monitor activities, documentation, and reporting can improve the effectiveness of evaluations and enable program adjustments based on the results obtained (Widiyarta & Kriswibowo, 2023). With these steps, it is hoped that environmental education can be more effective, collaborative, and sustainable. Addressing these challenges through collaborative governance approaches will not only strengthen program sustainability but also advance environmental equity by ensuring that all students regardless of socio-economic background receive comparable opportunities to engage in meaningful environmental learning.

4. Conclusions

This study concludes that Collaborative Governance is a strategic and transformative approach for strengthening the implementation of Environmental Education (EE) toward sustainable development. The literature review shows that partnerships between schools, government agencies, and local communities play a crucial role in shaping an adaptive, participatory, and environmentally responsible education ecosystem. Cross-sector collaboration not only enhances trust and accountability among stakeholders but also facilitates the integration of sustainability principles into education policies, curricula, and instructional practices.

Although challenges such as limited resources, coordination gaps, and weak policy support still hinder optimal implementation, the findings indicate that the success of EE programs depends heavily on sustained collaboration, strong green leadership, and continuous professional development for educators. These insights broaden the application of Collaborative Governance theory in the education sector by demonstrating that collaborative processes can serve as catalysts for social transformation supporting the Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 13 (Climate Action).

Conceptually, this study contributes original value by proposing the development of a Collaborative Environmental Education Framework as a guiding model for the design, implementation, and evaluation of collaborative-based EE programs. This framework offers a foundation for future research to examine how collaborative mechanisms can be adapted across diverse institutional and cultural contexts to strengthen the long-term sustainability of environmental education initiatives.

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Author Contribution

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The data used in this study comes from publicly available public documents (academic literature) based on selected articles from Scopus ([Appendix 1](#)). No new data was created primarily for this study.

Conflicts of Interest

The authors declare no conflict of interest in this research.

Declaration of Generative AI Use

During the preparation of this work, the authors used Grammarly to assist in improving grammar, clarity, and the academic tone of the manuscript. After using this tool, the authors carefully reviewed and edited the content as needed and took full responsibility for the content of the publication.

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Appendix 1. Summary of literature on school-based environmental management

Author	Method	Study Design	Finding	Highlights
Adiwiyata program based school management model can create environment-oriented school (Roswita, 2020)	-Research approach: Qualitative descriptive research - Research location: Public high school in Dumai -Participants: School community (educators, personnel, students, cleaning staff, cafeteria management) -Sampling method: Simple random sampling -Data collection methods: Observation, interviews, questionnaires, documentation - Data analysis: Qualitative and quantitative descriptive analysis using simple statistical approaches.	Qualitative descriptive research; observational study; simple random sampling; uncontrolled; non-experimental	- State Senior High School 2 and State Senior High School Binaan Khusus have environmentally oriented education plans, but some programs have not yet been implemented. - This study involves the entire school community in changing attitudes toward the environment through a developed model. - Both schools have not yet fully met the requirements for program implementation, particularly in terms of land and facility utilization.	This study analyzes and designs an Adiwiyata environment-based management model in schools built on wetlands, with a focus on involving the entire school community in instilling environmental awareness and attitudes and examines the implementation of the Adiwiyata program in two schools.
Environmental education in schools: sustainability and hope (Husin et al., 2025)	- Quantitative approach - Purposive sampling of 100 teachers in Palembang, Indonesia - Data collection through questionnaires - Descriptive analysis using average scores and percentages - Data analysis using Microsoft Excel	-Quantitative approach -Purposive sampling -Data collection through questionnaires -Descriptive analysis -Observational study	- Teachers have high expectations for schools, fellow teachers, and students regarding environmental education. -Schools should integrate environmental education into their vision, mission, and curriculum, with teachers acting as role models. -Continuous professional development and collaboration among teachers is recommended to improve environmental education practices.	This study explores the sustainability and expectations of environmental education in schools, finding high expectations among teachers for schools, themselves, and students, with recommendations to integrate environmental education into school policy, teacher development, and family involvement.
Bridging Vision and Reality: Examining Strategic Planning Implementation in Indonesian State Schools	-Descriptive method with a qualitative approach - Data collection: interviews, focus group discussions, observation, document analysis, case studies	Descriptive study with a qualitative approach; observational study using interviews, focus group discussions, observations, document analysis, and case	-School strategic planning must be flexible, data-driven, and involve various parties to meet local needs. -The implementation of strategic planning has had a positive impact on the quality of education,	This study examines the challenges and opportunities of strategic planning in Indonesian public schools, finding that a flexible, data-driven, and participatory

(Rosita & Kurniatun, 2025)	- Data analysis: NVivo 12 for qualitative data analysis	studies; qualitative data analysis using NVivo 12.	including academic achievement and school cultural transformation. -Each school has a unique strategic focus based on its context and needs, requiring a tailored approach.	approach improves educational quality, academic achievement, and school culture, with each school tailoring its strategy to local needs and challenges.
Green leadership and environmental awareness growing with Indonesia's Adiwiyata Program at a Kotabaru school (Herliana & Suriansyah, 2025)	-Descriptive qualitative approach -Data collection: observation, in-depth interviews, documentation -Data analysis: qualitative analysis method with an inductive approach	Observational study; Descriptive qualitative approach; Uncontrolled; Single site; Qualitative analysis with an inductive approach	-Green leadership plays an important role in creating a climate that supports environmental education. -Team synergy between students, teachers, and parents is effective in waste management, achieving a 75% reduction in plastic waste. - Collaboration between green leadership and the school community is essential to the success of the program.	The Adiwiyata Program at SMPN 1 Kotabaru has successfully raised environmental awareness among students and teachers through green leadership and team synergy, achieving significant reductions in plastic waste and promoting sustainability within the school community.
Caring for the environment in an inclusive school: The Adiwiyata Green School program in Indonesia (Prasetyo et al., n.d.)	--Using the CIPP (context, input, process, product) evaluation model. - Conducting semi-structured interviews with students, teachers, and principals. - Conducting direct observations of the school environment. - Analyzing documents such as photos, school vision and mission statements, and student journals. - Data analysis involves coding and categorizing data.	Qualitative study using the CIPP evaluation model; single-site study; semi-structured interviews, observations, and document analysis; conducted at SMK Negeri 3 Probolinggo; involving students, teachers, and the principal; data collection from February 2019 to July 2019; Qualitative data analysis using coding and regrouping.	The Adiwiyata Green School Program has successfully spread motivation and environmental awareness to both special needs and regular students. - The effectiveness of the program is realized through the optimization of personnel resources, curriculum, facilities, and quality control. - This study contributes to the theoretical discourse and practical implementation of character development in environmental care in inclusive schools.	This study explores the development of environmental awareness through the Adiwiyata Green School program in an inclusive school environment, finding success in motivating students with special needs and regular students to care for the environment, thereby contributing to sustainable development.