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COMMUNITY ENGAGEMENT ARTICLE

Introduction to Sustainable Infrastructure and Environment at Sangkhom Islam Wittaya School, Thailand

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Abstract
The Community Service Program (PKM) introduces Sustainable Infrastructure and Environmental Awareness to students of Sangkhom Islam Wittaya School, Thailand, through participatory and educational methods. This program aims to raise students' awareness, knowledge, and practical skills in caring for environmental cleanliness and managing natural resources effectively. The participatory approach was carried out through green school concept sessions, waste management practices, energy efficiency, and rainwater utilization. The results indicated a 26% increase in participants' understanding based on pre-test and post-test scores with observable changes in behavior towards maintaining cleanliness and saving energy. Islamic integration values throughout the activities also enhanced participants' spiritual motivation to protect nature as a religious moral responsibility. This program is effective in establishing an environmentally friendly culture at the school which can be applied as a model for sustainable education in different schools or even in Indonesia.

Keywords
Infrastructure; Environment; Sustainability.

Abstrak
Program Pengabdian kepada Masyarakat (PKM) mengenalkan Infrastruktur Berkelanjutan dan Kepedulian Lingkungan kepada para siswa Sangkhom Islam Wittaya School, Thailand, melalui metode partisipatif dan edukatif. Program ini bertujuan untuk meningkatkan kesadaran, pengetahuan, dan keterampilan praktis siswa dalam menjaga kebersihan lingkungan serta mengelola sumber daya alam secara efektif. Pendekatan partisipatif dilakukan melalui sesi konsep sekolah hijau, praktik pengelolaan sampah, efisiensi energi, dan pemanfaatan air hujan. Hasilnya menunjukkan peningkatan pemahaman peserta sebesar 26% berdasarkan nilai pre-test dan post-test, disertai perubahan perilaku yang terlihat dalam menjaga kebersihan dan menghemat energi. Integrasi nilai-nilai keislaman dalam seluruh aktivitas juga meningkatkan motivasi spiritual peserta untuk menjaga alam sebagai tanggung jawab moral keagamaan. Program ini efektif dalam membentuk budaya sekolah yang ramah lingkungan dan dapat diterapkan sebagai model pendidikan berkelanjutan di sekolah lain atau bahkan di Indonesia.

Kata Kunci
Infrastruktur;, Lingkungan; Berkelanjutan.

1 | PENDAHULUAN

The improvement of the quality of education is not only determined by the curriculum and educators but also by the quality of the physical infrastructure and the condition of the school environment. Adequate infrastructure of decent classrooms, good ventilation, sanitation facilities, as well as green open spaces and an environment that supports the learning process can strengthen students' motivation, concentration, and health. This is in line with the findings that green schools can lower the risk of disease improve resilience in learning activities among students. Sector Education is very important to increase awareness about the environment and caring for sustainable conservation for future generations (Pravitasari & Nugraheni, 2023). A sustainable environment basically was

created with a purpose to fulfill today's human needs without compromising future generations' needs. The major principle of this sustainable environment is managing natural resources properly and utilizing them well (Sari, 2025). In terms of environmental literacy context, literacy means the capability of individuals to comprehend apply and engage in complex issues related to environments that involve knowledge about concepts principles plus some skills necessary for interpreting scientific information concerning environmental problems (Miterianifa & Mawarni, 2024). Ecological awareness is very important in a sustainable environment because it is a basic foundation for creating balance between human beings with nature (Ridwan Syam *et al*., 2024). In Thailand continuing education programs are being promoted more through approaches such as "Education for Green Society" plus eco-school initiatives which integrate the whole school system into all aspects of curriculum facilities and community partnerships (Bamrungsetthapong & Author, 2025). Particularly schools found in suburban or out-of-town areas have more challenges regarding infrastructure which includes lack of facilities budget constraints plus not very conducive building conditions that would otherwise affect quality learning as well as student comfort (Meekaew & Saenkum, 2025).

Sangkhom Islam Wittaya School located at Tambon Sadao Amphoe Sadao Songkhla Province (Thailand) is an Islamic-based school from pre-school up to secondary level. This school has an integrated status with facilities covering a large area (±21 rai) and a number of buildings used for academic activities as well as meetings (Gustia *et al*., 2024). The sustainable use of infrastructure and the environment of schools, is closely related to aspects of education and curriculum. Sangkhom Islam Wittaya School adopts a diverse subject curriculum such as Islamic Education, the Qur'an, Arabic, Malay, as well as Science and Mathematics which opens up opportunities for the integration of environmental education and green infrastructure development into daily learning activities. Thus, physical and environmental infrastructure can serve as a direct learning tool on sustainability issues (Ngafif *et al*., 2024). Other than physical and curriculum aspects, stakeholders such as students, teachers, and the school community must be involved to realize a sustainable school environment. The community service programs that these schools implemented prove the participation of students and teachers in training for example regarding safe drug use and healthy lifestyles in schools. This proves that it is not only the focus of schools on buildings and physical environments but also on human well-being and capacity as part of a holistic school environment (Lailiy *et al*., 2024). Therefore it is very important for schools to formulate plans for infrastructure development that are integrated with a sustainable environment ranging from physical planning, green land utilization, energy and water efficiency, community involvement to strengthening the curriculum related to sustainability. This effort will support the vision of the school as an educational institution that is not only academically superior but also able to foster environmental awareness and operate facilities in a socially and ecologically responsible manner. In light of global urgency for sustainable development this development becomes strategic step for Sangkhom Islam Wittaya in answering challenges ahead.

2 | METHOD

The method of implementing this community service activity uses a participatory and educational approach, which emphasizes the active involvement of teachers, students, and the school in every stage of the activity. This approach was chosen so that the activity not only focuses on the transfer of knowledge about sustainable infrastructure and the environment, but is also able to foster practical skills, environmental care attitudes, and awareness of the importance of sustainable development in the school environment. The implementation of the activity is carried out through several stages as follows:

1) Preparation Stage
   In the initial stage, the implementation team coordinated with the management of Sangkhom Islam Wittaya School to identify the actual condition of the school infrastructure, such as the layout of the building, open space, drainage system, and the potential for green space development. The participants of the activity amounted to 50 people, consisting of teachers, students, and school administrative staff. The team also identified teachers' and students' level of understanding of the concept of sustainable environment as well as the challenges faced in managing school facilities.
2) Stages of Implementation of Activities
   This stage is the core of the service program which is carried out collaboratively and interactively, involving teachers, students, and education staff. The implementation of the activity is divided into several thematic sessions as follows:
   a) Introduction to Sustainable Infrastructure and Environment Session
      Participants were given an understanding of the basic concept of environmentally friendly school infrastructure, including energy efficiency, water management, waste reduction, and the use of green space. In this session, examples of good practices from sustainable schools in Thailand and Indonesia were also explained. Participants were invited to discuss the actual condition of the school and its potential development towards an

environmentally sound school.

b) Greening Workshop and Demonstration Session
This activity focuses on direct application through education on the creation of vertical gardens and the management of simple green areas in the school environment. Participants were given education on how to grow ornamental plants or vegetables in environmentally friendly media with local materials, such as used plastic bottles or paralon pipes. The purpose of this session is for participants to have practical skills in creating aesthetic, functional, and sustainable green spaces.

c) Green School Campaign Session
Participants are invited to design school environmental campaigns in the form of posters, slogans, or short videos that promote green lifestyles, such as electricity saving, reducing plastic waste, and cleaning classrooms. This activity aims to build collective awareness and foster a sense of social responsibility for the environment among students and teachers. Each session uses interactive lecture methods, small group discussions, case studies, and role simulations to encourage active participation and contextual learning (Kolb, 2015).

3) Evaluation Stage
Evaluation was carried out through a combination of pre-test and post-test, semi-structured interviews, and direct observation during the activity.

a) Pre-test and post-test were used to measure quantitative improvement in three key aspects: English language proficiency, understanding of digital ethics, and economic literacy. The test instruments are arranged based on the assessment rubric (Creswell & Creswell, 2018).

b) Semi-structured interviews were conducted on 10 participants who were purposively selected to explore changes in attitudes and perceptions after participating in the activity.

c) Direct observation was carried out using a structured observation sheet that contains indicators of active participation, cooperative ability, and the application of ethics in digital activities (Miles, Huberman, & Saldaña, 2019). Quantitative data were analyzed using comparative descriptive statistics (comparison of pre-test and post-test averages), while qualitative data were analyzed through thematic analysis with an open coding and categorization process to find participants' behavior patterns and perceptions.

3 | RESULTS AND DISCUSSION

3.1 Result

The community service activity with the theme "Introduction to Infrastructure and Sustainable Environment at Sangkhom Islam Wittaya School, Thailand" was carried out in accordance with the work plan that had been prepared with the school. The participants of the activity amounted to 50 people, consisting of teachers, students, and school administrative staff. The entire series of activities is designed collaboratively to not only provide theoretical knowledge about sustainable infrastructure and the environment, but also include hands-on practice involving the active participation of participants in each stage of the activity. The enthusiasm of the participants was evident from the beginning of the implementation, characterized by full attendance and active involvement in discussions and field practices. In the initial session, participants were introduced to the objectives and benefits of the activity through interactive lecture methods and ice breaking that created a fun learning atmosphere. Participants were motivated about the importance of understanding the concept of green infrastructure and sustainable environment for schools. The results of the observation showed that the participants were very enthusiastic in responding to the spark questions, such as about the use of electrical energy in the classroom and the potential for school greening. This approach is in line with the findings (Yuliani *et al*., 2020) which state that a participatory and dialogical approach can increase the motivation and involvement of participants in environmental education activities. Furthermore, in the introduction session of sustainable infrastructure, participants gained a fundamental understanding of how school infrastructure can be designed and managed in an environmentally friendly manner.

The material includes energy efficiency, rainwater management, plastic waste reduction, and the importance of green open spaces (RTH) for learning comfort. Participants were given examples of the implementation of green schools in various ASEAN countries and in Indonesia, such as the implementation of the Adiwiyata program which emphasizes the role of schools in building a culture of environmental care (Ministry of Environment and Forestry of the Republic of Indonesia, 2021). In the field practice session, participants were involved in vertical garden activities using simple materials such as used plastic bottles and paralon pipes. Participants were divided into small groups to design, plant, and arrange plants in previously underutilized school areas. This activity not only fosters creativity and technical skills, but also builds an attitude of cooperation and concern for the environment. The results of the practice showed that the entire group was able to produce a small garden that functioned as a learning medium and beautified the school environment. These findings are in line with research (Astuti & Suharyono, 2021) which shows that participatory-based greening projects in schools can improve students' ecological awareness and behavior. The next session was environmental

campaigns and education, where participants designed educational messages in the form of posters, slogans, and short videos with the theme "Green Schools, Comfortable Schools". These creative products are then displayed in school areas to foster collective awareness of the importance of eco-friendly behaviors. Based on observations, most of the participants showed an increased understanding of sustainability behaviors, such as energy saving, waste management, and reuse of used goods. These results are consistent with research (Sukmawati *et al*., 2022) that found that environmental project-based learning methods are effective in improving ecological literacy and social responsibility of secondary school students.

Figure 1. Activity Documentation

To find out the extent of the improvement in the understanding and skills of the participants after participating in this PKM activity, measurements were made through pre-test and post-test. A pre-test is given before the training session begins to measure participants' initial knowledge of human resource management and financial literacy. Meanwhile, the post-test is carried out after the entire series of activities is completed to assess the learning results obtained. The comparison between the results of the pre-test and post-test provides an overview of the level of effectiveness of the program in improving the competence of participants. The following diagram visually presents the results of these measurements for easier analysis.

Table 1. Pre-Test and Post-Test Results

Assessment Aspects	Indicators of Knowledge & Attitude	(Pre-Test)	(Post-Test)	Increased (%)
Understanding the Concept of Sustainable Infrastructure	Knowing the definition and examples of environmentally friendly infrastructure	56%	82%	26%
Energy Efficiency Awareness	Understanding how to save electrical energy in school	60%	84%	24%
Waste and Waste Management	Know the types of waste and how to manage it simply	54%	80%	26%
School Greening	Knowing the benefits and how to create a vertical garden	58%	85%	27%
Participation and Attitude of Environmental Care	Willingness to be involved in maintaining cleanliness and greening	62%	88%	26%
	Average	58%	84%	26%

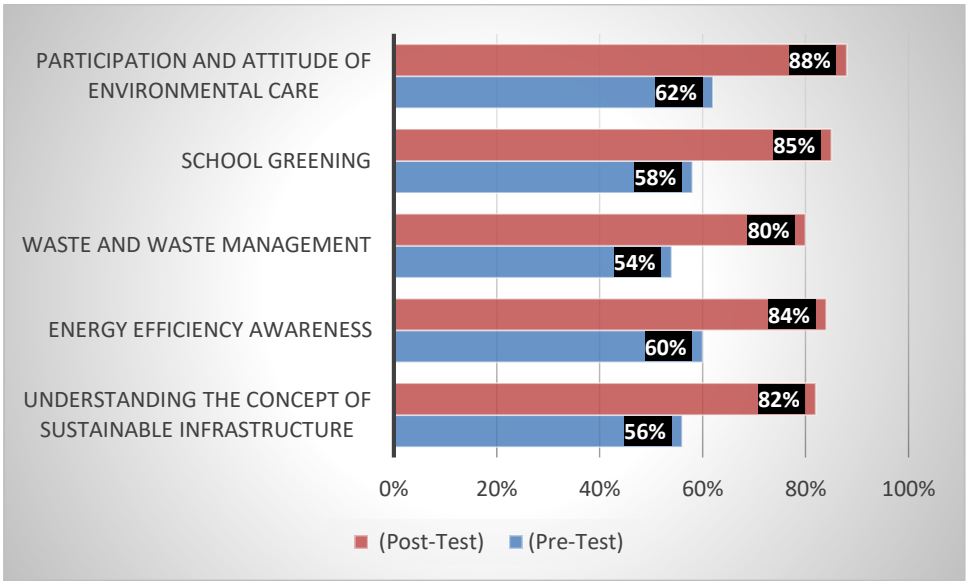

Figure 2. Pre-test and Post-test Results

The measurement results showed an average increase in comprehension scores by 26%, reflecting the effectiveness of participatory approaches and hands-on practice. Participants who previously did not understand the concept of energy efficiency or green space management are now able to explain the benefits and steps to implement them in the school context. This reinforces the finding (Lusardi & Mitchell, 2014) that experiential learning is able to significantly increase participants' knowledge retention and skills compared to conventional learning. In addition to increasing knowledge, the results of interviews and observations showed changes in participants' attitudes and behaviors. The teachers stated that they would integrate sustainability values in the teaching and learning process, while the students expressed their commitment to maintaining cleanliness and caring for the vertical garden that has been built. The school also agreed to form a Green Team as a follow-up to the activity, tasked with developing the school's sustainability program in a sustainable manner. This is in line with the practice of School-Based Management which emphasizes the collaboration of all school residents in environmental management (Suryana, 2020). Overall, this activity succeeded in achieving the goals that have been set. The introduction program of sustainable infrastructure and environment at Sangkhom Islam Wittaya School has improved environmental literacy, practical skills, and ecological awareness of participants. These results are in line with various studies in Indonesia, such as (Rahmawati *et al*., 2021) in the Journal of Environmental Education and Sustainable Development, which concluded that a participatory approach in environmental education has been proven to increase the capacity of schools to become adaptive and green-minded learning institutions.

3.2 Discussion

This community service activity showed a significant increase in participants' awareness of the importance of environmentally friendly infrastructure and the concept of sustainability in the school environment. Participants not only understood theories regarding energy efficiency and waste management, but also demonstrated behavioral changes in cleanliness and natural resource conservation practices. This is in line with the results of research (Rahmawati and Sari, 2021) which emphasized that a participatory approach in environmental education can increase students' sense of responsibility for school environmental conservation through concrete actions such as waste management and tree planting. The introduction of the concept of green school through this activity also encourages the realization of integration between formal learning and field practice. Teachers and students are involved in activities such as energy audits, rainwater utilization, and the creation of recycling-based school parks. This model strengthens the results of research (Suharti, 2020) which shows that the implementation of an environment-based curriculum in Indonesian elementary schools has a positive effect on the formation of students' environmental care character. Thus, the activities at Sangkhom Islam Wittaya have succeeded in adapting the values of participatory-based environmental education in a cross-country context. In addition to the cognitive aspect, this activity also strengthens students' practical competence in designing and implementing simple environmental projects. Participants were invited to create a mini composter and water-saving watering system, which fostered critical and collaborative thinking skills. Research (Yuliani *et al*, 2022) in Indonesian secondary schools found that project-based training in environmental themes improves students' systematic thinking skills and green leadership. These findings are in line with the results of activities in Thailand, where students are agents of change in maintaining cleanliness and energy efficiency in schools. The implementation of this activity also shows that there is a synergy between Islamic values and the principles of sustainability. Values such as cleanliness (thaharah),

responsibility for God's creation (khalifah fil ardh), and social solidarity are the moral basis for environmental management in schools. This approach is in line with research findings (Hidayat and Maulana, 2020) which highlight that environmental education based on religious values is effective in fostering ecological ethics among Muslim students. Thus, this activity is not only technical, but also strengthens the spiritual and social values of the participants. When compared to the results of research in Indonesia, the activities at Sangkhom Islam Wittaya show a similar pattern in terms of the effectiveness of participatory and contextual approaches. Research (Wahyuni *et al*., 2023) on the Eco-School program in Yogyakarta proves that the direct involvement of students and teachers in school environmental management is able to increase ecological awareness in a sustainable manner. Therefore, the success of this activity can be a learning model for schools in Indonesia, especially in strengthening the integration between sustainable infrastructure and environmental character education through relevant and fun hands-on practice.

4 | CONCLUSION

The Introduction to Sustainable Infrastructure and Environment program at Sangkhom Islam Wittaya School, Thailand, successfully achieved its objectives of enhancing students' awareness, knowledge, and skills related to the implementation of sustainability principles within the school environment. Through participatory and educational approaches, participants not only gained theoretical understanding but also actively engaged in eco-friendly practices such as waste management, energy efficiency, and the utilization of local resources. The program significantly improved students' ecological awareness, critical thinking abilities, and leadership in maintaining school cleanliness and environmental sustainability. The integration of Islamic values into environmental education strengthened the participants' moral and spiritual dimensions, fostering a sense of responsibility for environmental stewardship as part of their religious duty. As a practical implication, the school is encouraged to implement follow-up initiatives, including the development of waste-sorting Standard Operating Procedures (SOPs), conducting simple energy audits, establishing regular environmental maintenance schedules, and incorporating sustainability themes into the school curriculum. For future development, further research employing a multi-cycle quasi-experimental design is recommended to monitor the program's medium-term effectiveness, including tracking behavioral changes over 3–6 months and measuring tangible impacts such as reduced electricity consumption and waste generation.

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