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Profiling Students' Green Skills at MTs Al-Ma'arif 1, Sorong Regency, Based on Gender and Residential Area

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ABSTRACT

Green skills have become an essential competency for achieving sustainable development; however, empirical evidence regarding green skills among junior secondary school students, particularly in Eastern Indonesia, remains limited. Understanding students' green skills profiles is important to provide baseline evidence for designing sustainability-oriented science education. This study aims to profile the green skills of students at MTs Al-Ma'arif 1 in Sorong Regency based on gender and residential area. A quantitative descriptive design was employed involving 66 eighth-grade students selected through purposive sampling, including 28 male and 38 female students from urban, rural, and coastal areas. Data were collected using a green skills questionnaire covering five indicators: awareness of sustainable living, environmental resource management, eco-friendly behavior, ecological responsibility, and environmental problem-solving skills. Data were analyzed using descriptive statistics and non-parametric tests (Mann–Whitney U and Kruskal–Wallis). The results showed that students' green skills were generally in the high category. Female students achieved a higher average score (75.1%) than male students (65.19%). Students from rural areas obtained the highest average score (76.8%), followed by urban (68.1%) and coastal areas (64.58%). However, these differences were not statistically significant ($p > 0.05$). Environmental problem-solving skills and ecological responsibility showed the highest achievement, whereas environmental resource management required further improvement. This study provides baseline empirical evidence on students' green skills in an Islamic junior secondary school in Southwest Papua and highlights the importance of

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strengthening sustainability-oriented science education regardless of students' gender or residential background.

INTRODUCTION

The main challenges of the 21st century include climate change, environmental degradation, pollution, the excessive exploitation of natural resources, and the increasingly complex ecological crisis worldwide (Maharani, 2024; Nidiasari et al., 2026). All these issues have a direct impact on the sustainability of human life. This situation has prompted various countries to incorporate sustainable education into their educational systems (Putri & Rizaldi, 2024; Setiawan, 2025). The goal is to produce a generation that is environmentally conscious and capable of addressing these issues (UNESCO, 2023; Perdani et al., 2024). In this regard, one of the key competencies students must possess to support sustainable development is green skills (Fitriyanto et al., 2024). These global challenges require education systems not only to improve students' scientific literacy but also to develop competencies that enable learners to participate actively in environmental sustainability and responsible decision-making.

The Sustainable Development Goals (SDGs), particularly Goal 4 on quality education and Goal 13 on climate action, emphasize that education should not only focus on mastering cognitive skills but must also foster environmentally friendly behavior, ecological awareness, and the ability to make environmentally responsible decisions (Haloho et al., 2023; Perdani et al., 2024). Therefore, schools play a strategic role in instilling sustainability values through learning processes and a school culture that supports students' ecological behavior (UNEP, 2022; Putri & Rizaldi, 2024). Accordingly, Education for Sustainable Development (ESD) provides the conceptual foundation for integrating environmental competencies into formal education, ensuring that students develop the knowledge, values, and behaviors necessary for sustainable development (UNESCO, 2023; OECD, 2023).

According to modern pedagogical perspectives, green skills are considered one of the 21st-century competencies necessary for building a society that is adaptive to global environmental challenges (Aqilah & Lathifah, 2023; Sidiq et al., 2025). From a socio-ecological learning perspective, green skills are developed through continuous interactions between learners' personal characteristics, educational experiences, and environmental contexts. Consequently, students' environmental competencies are expected to vary according to both individual and contextual factors. By incorporating green skills into education, it is hoped that students will develop ecological awareness, the ability to think critically about environmental issues, and the ability to solve environmental problems in a contextual manner (Yuniar et al., 2024; Muhaemanurrohmah & Widiaty, 2026).

The knowledge, skills, principles, and attitudes that support sustainable and environmentally friendly behavior are known as green skills (Nizaar, 2022; Perdani et al., 2024). In education, green skills are a crucial component in shaping students' character so they can adapt to environmental challenges and sustainable development (Alwasi et al., 2023; Putri & Rizaldi, 2024). Green skills are not only related to theoretical knowledge about the environment but also to taking action in daily life (Muaddab et al., 2024). Relevant competency indicators for green skills in education include environmental awareness, wise resource management, eco-friendly behavior, ecological responsibility, and the ability to solve environmental problems (Riadi, 2026). Thus, the development of green skills in education is expected to foster students who possess critical thinking skills and ecological awareness in addressing various environmental issues (OECD, 2023; Ngongo et al., 2026).

Science education holds great potential for developing green skills because science curriculum content is directly related to natural phenomena, the environment, energy, ecosystems, and the sustainability of life (Putri et al., 2025). Environment-based science education enables students to understand environmental issues contextually through learning experiences closely tied to daily life (Haloho et al., 2023; Putri & Rizaldi, 2024). However, the implementation of green skills in education still faces various challenges, particularly regarding suboptimal learning integration and low levels of students' ecological activities in daily life (Amelia et al., 2025). Consequently, students' ecological awareness and environmentally friendly behaviors have not developed optimally. Science learning

therefore functions not only as a medium for acquiring scientific concepts but also as a means of fostering environmentally responsible attitudes and behaviors through authentic environmental experiences. This perspective suggests that the development of green skills is influenced by both learning processes and students' surrounding socio-environmental conditions.

Prior research has repeatedly shown that learning that is focused on sustainability enhances students' ecological responsibility, environmental awareness, and pro-environmental behavior (Haloho et al., 2023; Perdani et al., 2024; Fitri & Zainil, 2025). However, several significant research gaps remain. First, rather than establishing students' existing green skills as baseline data, most previous studies have focused on the effectiveness of environmental education initiatives. Second, despite the fact that these factors may influence students' ecological behaviors and environmental experiences, prior research has rarely examined green skills concurrently based on demographic characteristics like gender and residential area. Third, there is still a dearth of empirical data on Islamic Junior Secondary Schools known as *Madrasah Tsanawiyah* (MTs) in Indonesia, especially in Southwest Papua, especially in Southwest Papua. As a result, information about the distribution of green skills among students from various demographic and geographic origins is currently lacking.

The current study is based on the socio-ecological approach of learning, which holds that interactions between personal traits and environmental settings shape environmental skills. While contextual factors, such as living area, dictate students' opportunities to engage with natural surroundings and sustainability practices, individual characteristics, such as gender, may influence students' environmental attitudes, empathy, and pro-environmental conduct. Therefore, it is anticipated that differences in students' green skill profiles across the indicators of environmental awareness, resource management, ecological responsibility, environmentally friendly behavior, and environmental problem-solving skills will be correlated with differences in gender and residential area.

The development of green skills is particularly crucial in junior high schools because early adolescence is a critical period for the formation of students' character and social behavior (Supriyanto et al., 2023; Perdani et al., 2024). However, several studies indicate that students still exhibit low levels of environmental awareness. This is evidenced by students' attitudes toward environmental cleanliness issues, waste management, energy management, and the preservation of the school environment (Aqilah & Lathifah, 2023; Prameswari, 2025). Learning processes that focus on mastering concepts without linking the subject matter's to the real-world environmental context surrounding students affect the development of students' green skills (Putri & Rizaldi, 2024; Harpina et al., 2025). Many schools still teach science theoretically, so students do not gain learning experiences that foster deep environmental awareness.

Furthermore, research on the profile of green skills at the junior high school or MTs level remains relatively limited, particularly in the West Papua region. Most previous studies have focused on vocational education and higher education, thus failing to provide an empirical picture of the state of green skills among junior high school students (Muaddab et al., 2024; Nidiasari et al., 2026). Additionally, studies analyzing green skills based on students' gender and residential area remain scarce, particularly within the context of MTs education in Sorong Regency. These conditions indicate a research gap that warrants further investigation.

Theoretically, residential area is an important factor believed to influence students' green skills profiles (Harpina et al., 2025). Residential areas provide students with different ecological experiences (Ibda, 2022; Desi et al., 2023). Students living in coastal, urban, and rural areas have different environmental interactions, which may influence their environmental awareness and eco-friendly behavior (Nurrachmi et al., 2019; Aqilah & Lathifah, 2023). According to Supriyanti et al. (2025), green skills are also influenced by gender differences. Men and women have different social experiences, behavioral patterns, and sensitivities toward the environment (Kusumaningrum et al., 2021). Women tend to exhibit higher levels of environmental concern and pro-environmental behavior compared to men (Rahmawati et al., 2023; Hasanah et al., 2026). In the context of Sorong Regency, which has diverse geographical and social characteristics, gender and residential area are important factors in mapping students' green skills profiles.

Sorong Regency is characterized by diverse geographical environments, including urban, rural, and coastal areas, as well as rich environmental and cultural resources that are closely related to sustainable living practices (Suwarni, 2023). In addition, local Papuan communities possess values and

traditions that support environmental conservation and harmonious relationships with nature. These characteristics make Sorong Regency a relevant context for examining students' green skills profiles and for developing contextual environmental education programs.

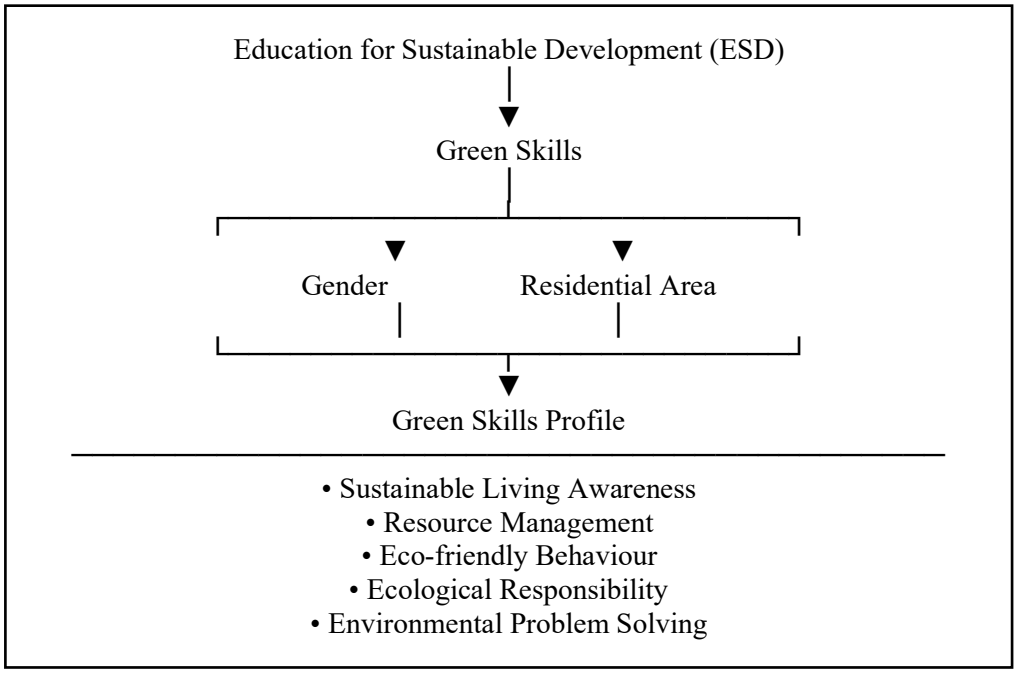


Fig.1. Conceptual framework of the study

Despite the growing interest in green skills research, no previous study has comprehensively profiled the green skills of MTs students in Southwest Papua by simultaneously examining gender and residential area across five indicators of green skills. Unlike previous studies that primarily evaluated intervention outcomes, this study provides baseline empirical evidence describing students' green skills within a unique socio-ecological context. Therefore, this study contributes theoretically by extending the understanding of demographic and geographical influences on green skills, methodologically by integrating multiple dimensions of green skills into a single profiling framework, and contextually by providing the first empirical evidence from Islamic junior secondary schools in Sorong Regency.

Based on the issues described above, this study aims to profile the green skills of students at MTs Al-Ma'arif 1, Sorong Regency, from the perspectives of gender and residential area. The study focuses on describing students' levels of sustainable living awareness, environmental resource management, environmentally friendly behavior, ecological responsibility, and environmental problem-solving skills. The findings are expected to contribute to the development of sustainability-oriented science education and environmental learning programs at the junior secondary school level. Based on the theoretical framework and previous empirical findings, this study proposes the following hypotheses: H1: There are significant differences in students' green skills based on gender. H2: There are significant differences in students' green skills based on residential area.

METHOD

This study employed a quantitative descriptive research design to profile students' green skills at MTs Al-Ma'arif 1, Sorong Regency, from the perspectives of gender and residential area. The study was conducted during the even semester of the 2025/2026 academic year at MTs Al-Ma'arif 1, Sorong Regency, Southwest Papua, Indonesia. The target population comprised all students enrolled at MTs Al-Ma'arif 1. However, the accessible population was limited to eighth-grade students because they had completed science learning related to environmental sustainability, ecosystems, and natural resource management, providing sufficient learning experiences to respond to the green skills questionnaire.

Purposive sampling was employed to ensure that participants met predetermined inclusion criteria. The inclusion criteria were: (1) being enrolled as an eighth-grade student at MTs Al-Ma'arif 1 during the 2025/2026 academic year, (2) having completed science learning on environmental sustainability topics, and (3) being willing to participate in the study. Students who did not meet these criteria or provided incomplete questionnaire responses were excluded from the analysis.

Based on these criteria, a total of 66 students were selected as research participants, consisting of 28 male students and 38 female students representing urban, rural, and coastal residential areas. This participant composition enabled the study to compare students' green skills across the demographic characteristics investigated while remaining consistent with the descriptive purpose of the research.

Data were collected using questionnaires, observations, and documentation techniques. The questionnaire served as the primary instrument for measuring students' green skills and employed a five-point Likert scale consisting of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD). The green skills questionnaire was developed by adapting and synthesizing several instruments that had previously demonstrated acceptable validity and reliability. Only minor linguistic and contextual adaptations were made to improve item clarity and relevance for junior secondary school students in Sorong Regency without changing the underlying constructs measured by the original instruments. The final questionnaire consisted of 45 items distributed across the five indicators: environmental awareness (15 items), resource management (6 items), eco-friendly behavior (8 items), ecological responsibility (10 items), and environmental problem-solving skills (6 items). Table 1 presents the operational definition and distribution of questionnaire items for each construct.

Table 1. Distribution of Green Skills Questionnaire Items

Construct	Source	Number of Items	Item Numbers
Environmental Awareness	Ramadany (2025)	15	1-15
Resource Management	Haloho et al. (2023)	6	16-21
Eco-friendly Behavior	Fubani et al. (2024)	8	22-29
Ecological Responsibility	Suryanda et al. (2020)	10	30–39
Environmental Problem-solving Skills	Syarif et al. (2025)	6	40-45
Total		**45**	

Observations were conducted to support questionnaire findings by examining students' environmental practices, such as waste management, school cleanliness, and environmentally friendly behaviors within the school environment. Documentation was used to obtain supporting information related to respondent demographics and school records relevant to the study. The research procedure consisted of five stages: (1) developing and adapting the research instrument based on established green skills indicators from previous studies; (2) determining the research sample; (3) collecting data through questionnaires, observations, and documentation; (4) organizing and tabulating the data; and (5) analyzing and interpreting the research findings. Prior to data collection, respondents were informed about the objectives of the study, and the confidentiality of all participant information was maintained throughout the research process.

Descriptive and inferential statistics were used to analyze the data. Students' green skills across the five characteristics were summarized using descriptive statistics according to residential area and gender. The results of the questionnaire were categorized using predefined green skills criteria after being transformed into percentages. The Mann–Whitney U test was used to investigate differences between male and female students because the data were not normally distributed. The Kruskal–Wallis test was used to examine differences between students from urban, rural, and coastal residential areas. IBM SPSS Statistics was used for statistical analysis, with a significance level of 0.05.

RESULTS AND DISCUSSION

The objective of this study was to profile the green skills of students at MTs Al-Ma'arif 1, Sorong Regency, from the perspectives of gender and residential area. The profile was examined through five indicators of green skills, namely sustainable living awareness, environmental resource management, environmentally friendly behavior, ecological responsibility, and environmental problem-solving skills. Overall, the findings revealed that students demonstrated high levels of green skills across all indicators. Inferential analyses further indicated that no statistically significant differences were found based on gender or residential area ($p > 0.05$). Moreover, the observed effect sizes were small ($r=0.10–0.23$), indicating that demographic characteristics contributed minimally to variations in students' green skills.

Respondent Characteristics

This study involved 66 eighth-grade students at MTs Al-Ma'arif 1, Sorong Regency. The respondents consisted of 28 male students (42%) and 38 female students (58%). The distribution of respondents by gender is presented in Figure 2.

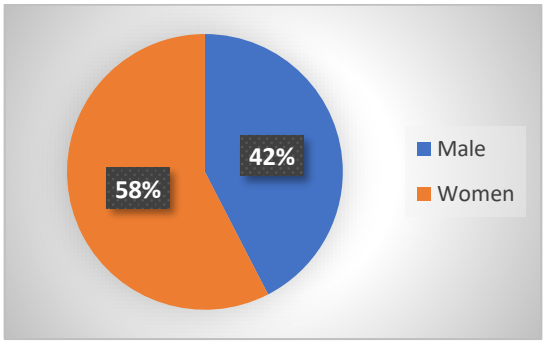


Fig.2. Diagram of student respondents by gender

Figure 2 shows that male students accounted for 42% of the respondents, while female students represented 58% of the sample. This indicates that the majority of participants in the study were female students. In addition to gender, respondents were categorized based on their residential area. Of the 66 students who participated in the study, 38 students lived in urban areas, 26 students resided in rural areas, and 2 students came from coastal areas. This distribution reflects the actual composition of Grade VIII students enrolled at MTs Al-Ma'arif 1, Sorong Regency, rather than a predetermined sampling proportion. The small number of students from coastal areas is attributable to the demographic characteristics of the school population, where only two Grade VIII students resided in coastal communities during the study period. These data indicate that most respondents were from urban areas, followed by rural areas, while only a small proportion of students lived in coastal areas. The distribution of respondents based on residential area is presented in Figure 3.

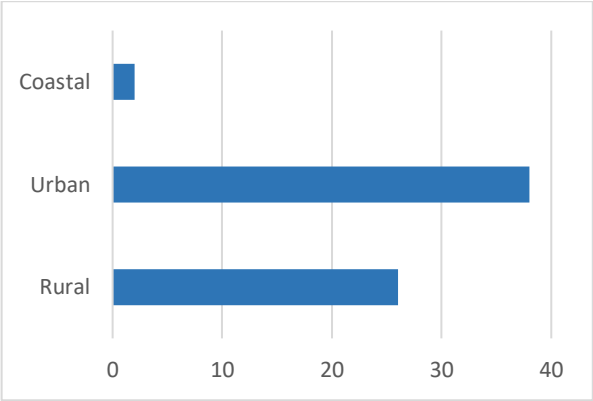


Fig.3. Distribution of respondents by residential area

Furthermore, Figure 3 shows that the majority of respondents resided in urban areas, followed by rural areas, while only a small proportion of respondents lived in coastal areas.

Students' Green Skills Profile

Students' green skills were measured using a questionnaire covering five indicators: environmental awareness, resource management, eco-friendly behavior, ecological responsibility, and environmental problem-solving skills. The questionnaire scores obtained from each respondent were converted into percentages to facilitate data interpretation.

The percentage scores were then classified into four categories, namely very high, high, moderate, and low, based on predetermined interpretation criteria. This categorization was used to describe students' green skills profiles across the measured indicators and to provide a clearer understanding of their environmental competencies. The interpretation criteria for green skills percentages are presented in Table 2.

Table 2. Interpretation of Green Skills Percentages

Percentage	Category
81–100	Very High
61–80	High
41–60	Moderate
≤40	Low

Students' green skills based on gender

The results of the analysis of the green skills of students at MTs Al-Ma'arif 1 in Sorong Regency based on gender are as follows Table 3.

Table 3. Data on Students' Green Skills by Gender

Green Skills Indicators	Male (%)	Female (%)
Sustainable Living Awareness	65.4	62.8
Environmental Resource Management	61.9	72.8
Eco-friendly Behavior	64.29	80.6
Ecological Responsibility	66.07	77.6
Environmental Problem Solving	68.45	81.6
Average	65.19	75.1

According to the calculation results for all green skills indicators, the average score for male students is 65.19%, falling into the high category. This score is derived from the average of the sustainable living awareness indicator at 65.4% in the high category, environmental resource management at 61.90% in the high category, eco-friendly behavior at 64.29% in the high category, ecological responsibility at 66.07% in the high category, and environmental problem-solving skills at 68.45%. In the high category. Thus, the level of green skills among male students at MTs Al-Ma'arif 1 in Sorong Regency falls into the high category.

Meanwhile, based on the green skills calculation results, female students achieved an average score of 75.1%, which falls into the high category. This score was derived from the average of the sustainable living awareness indicator at 62.8% in the high category, environmental resource management at 72.8% in the high category, eco-friendly behavior at 80.6% in the high category, ecological responsibility at 77.6% in the high category, and environmental problem-solving skills at 81.6% in the very high category. Furthermore, the students' green skills based on gender is presented in Figure 4.

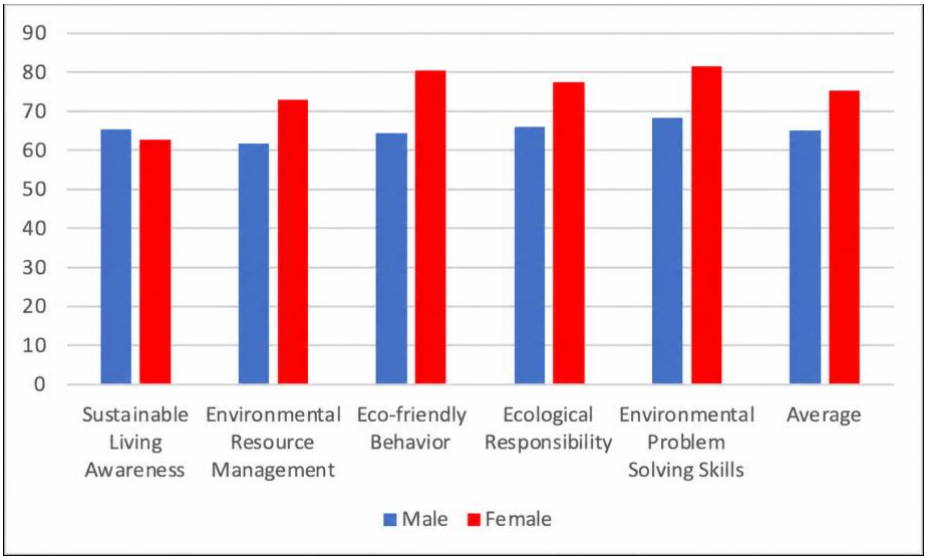


Fig.4. Green skills of students by gender

Based on the comparative data, the average green skills scores of female students are higher than those of male students. This difference is particularly evident in the indicators of environmentally friendly behavior, ecological responsibility, and environmental problem-solving, where female students scored higher. However, this difference in average scores is not statistically significant. Thus, descriptively, female students have a higher level of green skills compared to male students.

Furthermore, the research results indicate that gender is not a primary factor influencing students' green skills. Male and female students have comparable learning experiences, school environments, and access to environmental information. Therefore, this outcome is expected. These results align with Ikhsan (2023), who states that without being significantly influenced by gender differences, students' environmental awareness can be shaped by environmental education in schools. However, descriptively, female students exhibit more indicators of eco-friendly behavior and ecological responsibility than male students. This may be due to social and psychological factors, as women tend to possess greater empathy and, as noted by Supriyanti et al. (2025), demonstrate greater social concern for the environment compared to men.

Based on the Mann–Whitney U test results, the hypothesis regarding gender differences in students' green skills was rejected. No statistically significant differences were found between male and female students across the five green skills indicators ($p > 0.05$), and the observed effect sizes were small ($r = 0.10–0.23$), indicating minimal practical differences between the two groups.

Green skills based on residential area

The results of the analysis of students' green skills at MTs Al-Ma'arif 1, Sorong Regency, based on residential area are presented in Table 4.

Table 4. Students' Green Skills Based on Residential Area

Green Skills Indicators	Urban	Rural	Coastal
Sustainable Living Awareness	63.9	65.9	63.3
Environmental Resource Management	67.1	72.4	58.3
Eco-friendly Behavior	68.8	83.7	56.25
Ecological Responsibility	68.2	80.8	70
Environmental Problem Solving	72.8	81.4	75
Average	68.1	76.8	64.58

Based on the results of the calculation of green skills among students at MTs Al-Ma'arif 1 in Sorong Regency who live in urban areas, an average score of 68.1% was obtained, falling into the high category. This score was derived from the average of the following indicators: sustainable living awareness at 63.9% (high category), environmental resource management at 67.1% (high category), eco-friendly behavior at 68.8% (high category), ecological responsibility at 68.2% (high category), and environmental problem-solving skills at 72.8% (high category).

Furthermore, based on the results of the calculation of green skills among students at MTs Al-Ma'arif 1 in Sorong Regency who live in rural areas, an average score of 76.8% was obtained, falling into the high category. This score was derived from the average of the following indicators: sustainable living awareness at 65.9% (high category), environmental resource management at 72.4% (high category), eco-friendly behavior at 83.7% (very high category), ecological responsibility at 80.8% (high category), and environmental problem-solving skills at 81.4% (very high category).

Meanwhile, in coastal areas, the average green skills score for students at MTs Al-Ma'arif 1 in Sorong Regency was 64.58%, which falls into the high category. This score was derived from the average of the sustainable living awareness indicator at 63.3% (high category), environmental resource management at 58.33% (high category), eco-friendly behavior at 56.25% (high category), ecological responsibility at 70% (high category), and environmental problem-solving skills at 75% (high category). The profile of students' green skills based on residential area is presented in Figure 5.

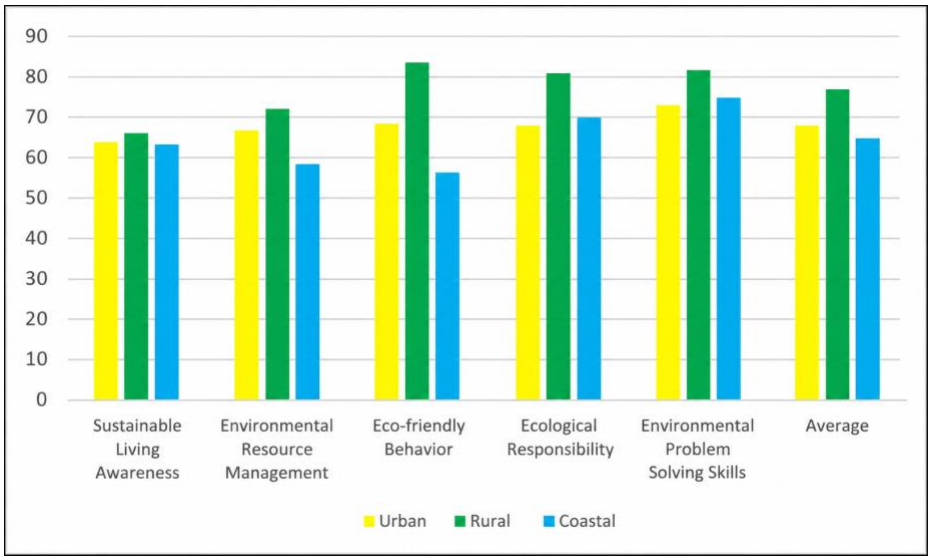


Fig.5. Green skills profile based on residential area

Figure 5 presents the distribution of students' green skills based on residential area. Students living in rural areas obtained the highest average green skills percentage, reaching 76.8%, which falls within the high category. Students from urban areas achieved an average percentage of 68.1%, while students residing in coastal areas obtained an average percentage of 64.58%. Both groups were also classified within the high category.

These findings indicate variations in green skills profiles among students from different residential areas. Students living in rural areas tended to demonstrate higher green skills percentages compared to students from urban and coastal areas. This tendency may be associated with greater exposure to natural environments and more frequent interactions with environmental resources in daily life. Rural students are often involved in activities closely related to agriculture, land management, and environmental stewardship, which may contribute to the development of environmental awareness and responsibility.

Meanwhile, students from urban and coastal areas also demonstrated high levels of green skills, although their average percentages were lower than those of rural students. Among these groups, relatively lower scores were observed in several indicators, particularly environmental resource management and eco-friendly behavior. These findings suggest that strengthening sustainability-

oriented learning experiences may further support the development of students' environmental competencies across different residential settings.

Overall, the findings show that students from urban, rural, and coastal areas were categorized as having high levels of green skills. This result indicates that environmental awareness, ecological responsibility, environmentally friendly behavior, resource management, and environmental problem-solving skills have generally been developed among students at MTs Al-Ma'arif 1, Sorong Regency. Nevertheless, variations in percentage scores across residential areas highlight the importance of considering local environmental contexts when designing environmental education and sustainability-based learning programs.

Research Implications

The findings of this study have several important implications for science education, environmental education, and sustainability-oriented learning. The generally high levels of green skills demonstrated by students indicate that environmental values and sustainability awareness have begun to develop among junior secondary school students. This finding is consistent with the Education for Sustainable Development (ESD) framework, which emphasizes that schools play an important role in developing sustainability competencies by integrating environmental knowledge, values, and responsible actions into learning (UNESCO, 2023). Therefore, science education should continue to integrate environmental and sustainability issues into learning activities through contextual, inquiry-based, project-based, and problem-based learning approaches. Such approaches can provide students with meaningful opportunities to apply environmental knowledge, develop ecological responsibility, and strengthen environmental problem-solving skills in real-life situations.

The findings also suggest that environmental education should not be limited to classroom instruction but should be supported through school-wide sustainability programs. Schools can strengthen students' green skills through activities such as waste management programs, school gardening projects, energy conservation campaigns, environmental monitoring activities, and participation in green school initiatives. These activities may help students translate environmental awareness into sustainable behaviors and practices. This implication is consistent with Experiential Learning Theory, which suggests that students develop knowledge, skills, and responsible behavior through authentic learning experiences and reflective practice (Kolb & Kolb, 2022).

Furthermore, the variations observed in students' green skills profiles across residential areas highlight the importance of considering local environmental contexts when designing learning experiences. Environmental education programs should be adapted to students' daily environmental realities and community experiences to enhance their relevance and effectiveness. This finding is also supported by Social Cognitive Theory, which explains that students' behaviors are shaped through interactions between personal factors and their learning environment (Bandura, 1986). In the context of Sorong Regency, sustainability-oriented learning can be enriched by incorporating local environmental knowledge and community practices related to natural resource conservation.

This study also contributes to the limited body of research on green skills among junior secondary school students, particularly in Eastern Indonesia and Southwest Papua. The findings provide baseline data that can support the development of environmental education policies, sustainability-oriented curricula, and ethnoscience-based learning models that are relevant to the sociocultural and environmental characteristics of Papuan communities. In addition, the results may serve as a reference for future studies exploring the development of green skills through innovative learning interventions and sustainability education programs. Overall, these findings suggest that green skills are developed primarily through meaningful educational experiences rather than demographic characteristics alone, highlighting the importance of sustainability-oriented science education.

Research Limitations

This study has several limitations that should be considered when interpreting the findings. First, the distribution of respondents across residential areas was not balanced, particularly for students living in coastal areas, which were represented by only a small number of participants. As a result, the green skills profile of coastal students may not fully represent the characteristics of students living in coastal communities in Sorong Regency.

Second, the study was conducted in only one Islamic junior secondary school (MTs Al-Ma'arif 1) in Sorong Regency. Therefore, the findings should be interpreted within the context of the study and cannot be generalized to all MTs students in Southwest Papua or other regions with different educational and environmental characteristics.

Third, data were collected primarily through a self-report questionnaire. Although the instrument was developed based on established green skills indicators, students' responses may have been influenced by personal perceptions and social desirability factors. Consequently, the reported green skills levels may not fully reflect students' actual Eco-friendly Behavior in everyday situations.

Finally, this study employed a descriptive research design that focused on profiling students' green skills. Therefore, the findings do not explain causal relationships or factors influencing the development of green skills. Future studies are encouraged to involve larger and more diverse samples, include schools from different geographical regions, and employ mixed-methods or experimental approaches to obtain a more comprehensive understanding of students' green skills development and the factors that shape environmental competencies.

CONCLUSION AND SUGGESTION

This study aimed to profile the green skills of students at MTs Al-Ma'arif 1, Sorong Regency, from the perspectives of gender and residential area. The findings revealed that students generally demonstrated high levels of green skills across the five measured indicators, namely sustainable living awareness, environmental resource management, environmentally friendly behavior, ecological responsibility, and environmental problem-solving skills. Based on gender, female students tended to achieve higher green skills percentages than male students, although both groups were categorized within the high category. However, inferential analysis indicated that these differences were not statistically significant, suggesting that gender had only a minimal influence on students' green skill. Based on residential area, students living in rural areas obtained the highest average green skills percentage, followed by students from urban and coastal areas. Nevertheless, all residential groups demonstrated green skills within the high category, indicating that environmental awareness and sustainability-related competencies have been relatively well developed among students at MTs Al-Ma'arif 1.

This study contributes to the growing body of research on green skills by providing empirical evidence that students' green skills can be consistently developed across different demographic backgrounds within the same educational environment. The findings reinforce the importance of school-based environmental education in fostering sustainability competencies and provide baseline evidence for the development of sustainability-oriented and ethnoscience-based science learning, particularly in the context of junior secondary schools in Eastern Indonesia.

These findings highlight the importance of integrating sustainability and environmental education into science learning and school programs to further strengthen students' green skills. Future studies are recommended to involve larger and more diverse samples, employ mixed-methods approaches, and examine additional factors that may contribute to the development of green skills, such as school culture, family environment, local wisdom, and ethnoscience-based learning practices.

CONFLICTS OF INTEREST

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, S.Sy.; methodology, S.Sy. and F.A.H.; instrument development, S.Sy.; investigation, S.Sy.; data collection, S.Sy.; formal analysis, S.Sy.; data curation, S.Sy.; visualization, S.Sy.; validation, F.A.H. and S.Sr.; supervision, F.A.H. and S.Sr.; interpretation of data, F.A.H.; project administration, S.Sr.; critical review of the manuscript, S.Sr.; writing—preparation of the original draft, S.Sy.; writing—review and editing, F.A.H. and S.Sr. All authors have read and agreed to the published version of the manuscript.

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DECLARATION OF GENERATIVE AI SOURCES

Generative artificial intelligence was not used to generate, process, or analyze the research data. All interpretations of the results, discussions, and scientific conclusions were conducted independently by the authors based on the research data obtained.

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