WJSAM | World Journal of Sustainable Advances in Multidisciplinarity
RESEARCH | INNOVATION | INTERDISCIPLINARITY | SUSTAINABILITY
Volume 1, Issue 2 | ISSN: 3155-783X
DOI: https://doi.org/10.65339/wjsam.V1.I2.31

Eco-Tourism Practices Among Leading Tourism Sites in Siargao Island

Yasmine Lorrene Q. Villagracia[1], Janille S. Besas[1], Ednalin E. Catamora[1], Aira Maurenne B. Labaya[1], Reynald Olivan[1], Maria Lelanie A. Goyonan, PhD[2], Juvy Navales Buo, MBA[2]

[1]Bachelor of Science in Tourism Management, Siargao Island Institute of Technology, Dapa, Surigao del Norte, Philippines

[2]Research Adviser, Siargao Island Institute of Technology, Dapa, Surigao del Norte, Philippines

Email: lorrene0415@gmail.com

ABSTRACT

This study examined the implementation of eco-tourism practices and their relationship with perceived environmental sustainability across four nature-based tourism sites on Siargao Island, Philippines. Using a quantitative descriptive-correlational design, the researchers surveyed 200 conveniently selected respondents comprising 72 tourists, 65 local residents, and 63 tourism staff at Secret Beach, Magpupungko Rock Pools, Taktak Falls, and Maasin River. Data were collected through a structured four-point questionnaire and analyzed using descriptive statistics, Spearman's rank-order correlation, Mann-Whitney U tests, and Kruskal-Wallis tests. Waste management and community participation received the highest implementation ratings (both M = 3.16), while natural resource conservation received the lowest (M = 3.06). Perceived environmental sustainability was favorable (M = 3.21). All five eco-tourism dimensions were significantly and positively associated with sustainability perceptions (ρ = 0.584-0.680, all $p < 0.001$), with environmental education showing the strongest relationship. Perceptions differed significantly by nationality category across all dimensions and by age in two dimensions, but not by sex or civil status. The findings indicate that coordinated eco-tourism practices are associated with favorable sustainability perceptions, without establishing causality. Tourism managers should strengthen conservation monitoring and environmental education while sustaining waste management and community participation. Convenience sampling, four-site coverage, and reliance on self-reported perceptions limit generalizability and ecological interpretation. The study provides localized evidence to inform inclusive, evidence-based sustainability planning and environmental management in Siargao's tourism destinations.

Keywords: *Community Participation, Ecotourism Practices, Environmental Education, Environmental Sustainability, Resource Conservation, Siargao Island, Waste Management*

1. INTRODUCTION

1.1. Background and Context of the Study

Ecotourism has become important in destinations where community livelihoods and visitor experiences depend on the conservation of natural environments. Sustainable tourism management involves balancing environmental protection, economic activity, and the interests of host communities. This perspective draws on the foundational sustainable development framework of the World Commission on Environment and Development (1987). More recent scholarship has emphasized stakeholder participation in destination planning and environmental stewardship (Iqbal et al., 2022; Lukoseviciute et al., 2024). The Global Sustainable Tourism Council (2026) likewise highlighted the importance of practical sustainability standards, destination assessment, and collaborative management. These considerations are particularly relevant to Siargao Island, Philippines, where beaches, rock pools, waterfalls, rivers, and coastal ecosystems support nature-based tourism. The Department of Environment and Natural Resources (DENR, 2025) described the Siargao Island Protected Landscape and Seascape as an area containing interconnected terrestrial, wetland, and marine environments. Tourism-related activities create opportunities for employment and local enterprise but also require responsible waste management, resource conservation, and protection of sensitive natural settings. Serrona et al. (2022) examined marine litter challenges in the Siargao Islands and discussed preventive approaches involving policies, local communities, and circular-economy practices. Against this background, the present study examined Secret Beach in Malinao, General Luna; Magpupungko Rock Pools in Pilar; Taktak Falls in Santa Monica; and Maasin River. These sites represented different nature-based attractions and provided settings for investigating the perceived implementation of waste management, conservation of natural resources, environment-friendly materials and facilities, environmental education, and community participation. The study also assessed perceived environmental sustainability, recognizing the need to distinguish stakeholders' assessments from direct ecological measurements.

1.2. Research Problem

Although natural attractions sustain tourism activity, visitation and tourism operations can create pressure through waste generation, pollution, resource use, and disturbance of sensitive environments. The United Nations Environment Programme (2021) documented the ecological implications of marine litter and plastic pollution, while Serrona et al. (2022) examined waste-related challenges affecting island tourism in Siargao. These concerns warrant attention from tourism operators, local residents, visitors, and authorities responsible for environmental management. In the Philippines, Republic Act No. 9003, or the Ecological Solid Waste Management Act of 2000, establishes the legal framework for waste segregation, reduction, and environmentally responsible solid waste management (Republic of the Philippines, 2001). A separate Siargao protected-area assessment documented the use of ecological monitoring to examine marine habitat conditions (DENR, 2024). However, legal provisions and ecological assessments do not directly explain how different stakeholder groups perceived the implementation of eco-tourism practices at individual tourism attractions. The study therefore addressed the need to assess perceived implementation across five eco-tourism dimensions, determine perceived environmental sustainability, examine differences associated with demographic characteristics, and test the relationship between these two principal variables. This localized, stakeholder-based assessment remained a distinct concern from the broader environmental issues described in existing research.

1.3. Research Gap

Previous studies examined important components of sustainable tourism but did not resolve the specific questions investigated in this study. Serrona et al. (2022) discussed marine litter management in the Siargao Islands, while a DENR (2024) assessment examined marine habitat

conditions through ecological monitoring. These approaches differ from assessing how tourists, local residents, and tourism staff perceived eco-tourism practices and environmental sustainability at the four selected attractions. Beyond Siargao, Meschini et al. (2021) evaluated educational briefings for tourists, Iqbal et al. (2022) reviewed community participation in sustainable tourism, and Hafezi et al. (2023) developed a community-based ecotourism model. Fabillar et al. (2024) also studied local residents' ecotourism knowledge, attitudes, and practices in Samar. Together, these works informed particular dimensions, yet they did not establish the combined perceived implementation of the five specified practices, their association with perceived environmental sustainability, or demographic differences in the study's selected Siargao sites. The present study addressed this contextual and analytical gap.

1.4. Purpose and Objectives of the Study

This study examined eco-tourism practices across four selected tourism sites on Siargao Island: Secret Beach, Magpupungko Rock Pools, Taktak Falls, and Maasin River. It described respondents, comprising tourists, local residents, and tourism staff, according to age, sex, civil status, and nationality. The study determined perceived implementation of waste management, conservation of natural resources, environment-friendly materials and facilities, environmental education and initiatives, and community participation. It also assessed perceived environmental sustainability, tested the relationship between implementation and sustainability ratings, and examined differences in implementation ratings by demographic profile. Based on the findings, the study sought to propose recommendations for strengthening eco-tourism practices and environmental sustainability at the selected sites.

1.5. Significance and Practical Contribution of the Study

The study provided a localized basis for understanding how key tourism stakeholders assessed eco-tourism practices and environmental sustainability. Its findings may guide tourism site managers in reviewing waste management, conservation, facility choices, environmental education, and community involvement. Local government units and environmental organizations may use the results to inform site-level planning, awareness activities, and coordinated conservation efforts. The study also contributed to academic discussions of sustainable tourism by examining perceptions across multiple practice dimensions and their association with perceived environmental sustainability. Its proposed recommendations were intended for the four selected attractions, and interpretation remained appropriately limited by convenience sampling and the reliance on self-reported assessments rather than direct ecological measurements.

1.6. Sustainable Development Goals (SDG) Alignment

The study aligned with three relevant United Nations Sustainable Development Goals identified in the United Nations Department of Economic and Social Affairs (2025) reporting framework. SDG 12: Responsible Consumption and Production relates to the investigation of waste management, resource efficiency, and environment-friendly tourism materials and facilities. SDG 14: Life Below Water is relevant to the management of litter and environmental pressures affecting Siargao's coastal and marine environments. SDG 15: Life on Land relates to conservation and responsible use of the terrestrial and freshwater settings supporting the selected attractions. By assessing stakeholder perceptions, the study offered information to guide responsible tourism recommendations; it did not directly measure ecological change or progress against official SDG indicators.

2. METHODOLOGY

2.1. Research Design

This study employed a quantitative descriptive-correlational research design to assess eco-tourism practices and environmental sustainability at selected tourism sites on Siargao Island. Its descriptive component examined respondents' demographic profiles, perceived implementation of eco-tourism practices, and levels of environmental sustainability. Its correlational component assessed the relationship between eco-tourism practices and environmental sustainability. The study also compared perceptions across demographic groupings. Numerical responses collected through a structured questionnaire were analyzed using descriptive and inferential statistical procedures, consistent with established approaches to survey research (Zimba & Gasparyan, 2023).

2.2. Research Locale and Respondents

The study covered four nature-based attractions on Siargao Island: Secret Beach in Malinao, General Luna; Magpupungko Rock Pools in Pilar; Taktak Falls in Santa Monica; and Maasin River. Sites met criteria for visitor recognition, nature-based resources, tourism activity, respondent availability, and site permission. The 200 respondents comprised 72 tourists (36.0%), 65 local residents (32.5%), and 63 tourism staff (31.5%). At Secret Beach (n = 60; 30.0%), tourist, resident, and staff counts were 20, 20, and 20; at Magpupungko (n = 60; 30.0%), 20, 20, and 20; at Taktak Falls (n = 35; 17.5%), 15, 10, and 10; and at Maasin River (n = 45; 22.5%), 17, 15, and 13.

2.3. Sampling Technique and Sample

Convenience sampling recruited available and willing tourists, local residents, and tourism staff at the four sites during data gathering. Participants had direct experience with, or exposure to, the sites' tourism activities and environmental practices. This approach enabled researchers to gather perspectives from three stakeholder groups. The achieved sample comprised 200 respondents, with unequal numbers across sites. As convenience sampling limits population-level generalization, findings describe the participating respondents rather than the wider Siargao Island population (Andrade, 2021; Stratton, 2023).

2.4. Research Instrument

The researchers used a structured questionnaire developed around the study objectives and indicators of eco-tourism practices. It covered waste management, conservation of natural resources, environment-friendly materials and facilities, environmental education and initiatives, community participation, and perceived environmental sustainability. Demographic items addressed age, sex, civil status, and nationality. The four-point Likert-type response format measured agreement (Taufique et al., 2026): 4, Strongly Agree; 3, Agree; 2, Disagree; and 1, Strongly Disagree. Implementation means were interpreted as highly implemented (3.25-4.00), implemented (2.50-3.24), less implemented (1.75-2.49), and not implemented (1.00-1.74).

2.5. Data Gathering Procedure

Data collection began with questionnaire development and finalization. The researchers then prepared formal permission letters and obtained approval from the concerned authorities and management at each selected tourism site. They personally approached tourists, local residents, and tourism staff, explained the study's purpose, and informed them that participation was voluntary and responses would remain confidential. Questionnaires were distributed, assistance was provided when needed, and completed forms were retrieved for analysis.

2.6. Data Analysis and Statistical Treatment

Responses from 200 participants were analyzed using the four-point scale. Frequency and percentage summarized demographic characteristics. Means, standard deviations, and

weighted means described perceived implementation of eco-tourism practices and environmental sustainability, using the stated interpretation ranges. Spearman's rank-order correlation examined the association between eco-tourism practices and environmental sustainability. The Mann-Whitney U test evaluated differences between two groups, while the Kruskal-Wallis test compared three or more groups; these test applications are consistent with current statistical guidance (Chicco et al., 2025; Kim et al., 2024). Statistical significance was set at 0.05.

2.7. Ethical Considerations

Participation was voluntary, and informed consent was obtained before questionnaire administration. Researchers explained the study's purpose, maintained confidentiality and anonymity, and respected each participant's right to withdraw without penalty or negative consequences. No identifying information was included in the analysis or final report. Responses were used exclusively for academic purposes, stored securely, and properly disposed of after the study. Site-level permissions were obtained from relevant authorities and management. These safeguards reflect ethical considerations in survey research (Zimba & Gasparyan, 2023).

3. RESULTS AND DISCUSSION

3.1. Demographic Characteristics of the Respondents

The age distribution showed that 89 of the 200 respondents (44.5%) were 25-34 years old, constituting the largest category. This group was followed by those aged 18-24 years (55; 27.5%), 35-44 years (41; 20.5%), 45-54 years (11; 5.5%), and 55 years or older (4; 2.0%). Cumulative percentages were 27.5%, 72.0%, 92.5%, 98.0%, and 100.0%, respectively. Thus, 185 respondents, or 92.5%, were between 18 and 44 years of age, with comparatively small numbers in the two oldest groups. These figures describe the respondents included in this study, not the age distribution of Siargao Island's tourism workforce or the island's overall visitor population.

Of the respondents, 116 (58.0%) were female and 84 (42.0%) were male. In terms of civil status, 154 (77.0%) were single, 38 (19.0%) were married, seven (3.5%) were widowed, and one (0.5%) was separated or divorced. The survey grouped respondents into three broad categories: Asian (n = 95; 47.5%), European (n = 75; 37.5%), and American (n = 30; 15.0%). As these categories are broadly defined, they should not be treated as detailed measures of country of citizenship, cultural identity, or immigration status. In particular, the civil-status categories were highly imbalanced, a feature relevant to interpreting the later group comparisons.

The study included tourists, local residents, and tourism personnel. Accordingly, this respondent profile supports interpretation of the sample's ratings but cannot be generalized to one occupational or population group. Wang et al. (2023) demonstrated the relevance of distinguishing residents' and tourists' perspectives when examining environmentally responsible behavior in ecotourism, while Dela Cruz et al. (2024) investigated perceived sustainability practices among tourists in a Philippine tourism setting. These studies reinforce the need to interpret ratings in relation to respondents' roles and characteristics rather than infer patterns of employment or environmental behavior from demographic proportions alone. A practical implication is to offer environmental guidance and engagement opportunities that remain accessible across demographic backgrounds.

3.2. Perceived Implementation of Eco-tourism Practices

The perceived implementation of eco-tourism practices was assessed across five dimensions, with 200 observations for each domain on the study's four-point scale. Waste Management and

Community Participation obtained the highest and equal means (M = 3.16), with standard deviations of 0.604 and 0.596, respectively. Use of Environment-friendly Materials and Facilities followed (M = 3.11, SD = 0.657), then Environmental Education and Initiatives (M = 3.07, SD = 0.677) and Conservation of Natural Resources (M = 3.06, SD = 0.601). All five domain means fell within the study's implemented category (2.50-3.24), indicating favorable perceived implementation across the assessed eco-tourism practices.

The ratings indicate that respondents evaluated waste management and community participation somewhat more favorably than resource conservation and environmental education. The difference between the highest and lowest means was 0.10 point. Accordingly, these rankings reflected descriptive differences among the five domains rather than statistically established differences in implementation. The relatively lower means for conservation and environmental education do not imply that these practices were absent or ineffective; rather, they suggest domains deserving closer operational attention within an otherwise favorable set of responses.

The pattern is consistent with literature on sustainable destination operations. Tsai et al. (2021) explained that solid-waste management in coastal and marine tourism settings involves interconnected management, policy, and stakeholder considerations. Sakcharoen et al. (2023) examined low-carbon municipal solid-waste alternatives and community participation in a Thai tourism destination, emphasizing practical approaches to waste management. Iqbal et al. (2022) further highlighted meaningful community participation as part of sustainable tourism development. Together, these publications provide context for the comparatively strong waste-management and community-participation ratings in the present study; they do not independently establish the effectiveness of practices at the surveyed Siargao sites.

For tourism operators and environmental authorities, the findings support maintaining waste-management activities and community engagement while strengthening resource conservation, monitoring, and the visibility of environmental education. The Global Sustainable Tourism Council (2026) likewise identifies natural-asset protection, pollution reduction, destination monitoring, and resident participation as important aspects of sustainable destination management. Overall, respondents perceived the five eco-tourism dimensions positively, with modest variation that can inform the prioritization of local sustainability initiatives.

3.3. Perceived Level of Environmental Sustainability

Respondents reported favorable perceptions of environmental sustainability, with an overall mean of 3.21 (SD = 0.562; N = 200). This result indicates that the participating respondents generally perceived environmental sustainability favorably at the tourism sites examined. The standard deviation describes dispersion in these perceptions and does not demonstrate uniform environmental conditions or equal performance across the individual destinations. This finding should be distinguished from direct assessments of ecological conditions. A favorable perception score cannot, by itself, establish improved biodiversity, reduced pollution, resource regeneration, or compliance with environmental carrying capacities. The Global Sustainable Tourism Council (2026) frames destination sustainability in terms of management, measurable monitoring, protection of sensitive environments, pollution control, and stakeholder participation. Lukoseviciute et al. (2024) likewise emphasized collaborative planning and management of natural and cultural assets in sustainable tourism destinations. These

perspectives suggest that respondents' positive assessments are relevant to local sustainability governance but should be considered alongside operational and ecological indicators. The practical implication is to complement perception surveys with routinely documented measures appropriate to each tourism site, including resource-use and waste-management records, conservation activities, and environmental monitoring undertaken with local authorities and conservation groups. Such information would help distinguish perceived sustainability from observable environmental outcomes. Overall, respondents expressed favorable perceptions of environmental sustainability. These ratings represented stakeholder assessments rather than direct measurements of ecological outcomes.

3.4. Associations Between Eco-Tourism Practices and Environmental Sustainability

Spearman rank-order correlation analysis showed positive and statistically significant associations between all five eco-tourism practice dimensions and perceived environmental sustainability ($N = 200$; all $p < 0.001$, two-tailed). Environmental Education and Initiatives had the highest reported correlation ($\rho = 0.680$), followed by Use of Environment-friendly Materials and Facilities ($\rho = 0.630$), Waste Management ($\rho = 0.614$), Conservation of Natural Resources ($\rho = 0.593$), and Community Participation ($\rho = 0.584$). Each association met the conventional 0.05 significance threshold. Consequently, the null hypothesis of no significant relationship was rejected for all five eco-tourism dimensions. These results indicate that respondents who gave more favorable ratings to a particular eco-tourism practice also tended to give more favorable ratings to environmental sustainability. Environmental education displayed the largest observed coefficient, although the reported analyses did not test whether this coefficient was statistically larger than those of the other domains. Because the measures were perception-based and were examined using a correlational design, the coefficients do not indicate that stronger implementation caused an improvement in independently measured environmental conditions. Nor do they rule out shared response tendencies or other unmeasured influences on respondents' ratings.

The observed educational association is compatible with research highlighting environmental knowledge and responsible tourism behavior. Wang et al. (2024) investigated how different forms of environmental education relate to tourists' environmentally responsible behavior, while Yu et al. (2024) examined environmental education, emotional responses, and environmentally responsible behavior among tourists. These studies address behavior rather than the exact sustainability-perception outcome in the present study, but they provide a pertinent conceptual basis for treating educational initiatives as an important element of destination management. Iqbal et al. (2022) similarly positioned community involvement within a broader system of tourism sustainability. The findings support a coordinated management approach that considers education, facilities, waste protocols, conservation, and community engagement together. Educational programs may be prioritized for further assessment because of their comparatively strong observed association, while the other dimensions should not be disregarded. The central conclusion remains that all five eco-tourism practices were positively associated with respondents' sustainability perceptions, not that any one practice independently produced environmental improvements.

3.5. Differences in Eco-tourism Perceptions by Age

Kruskal-Wallis tests assessed differences in perceived eco-tourism implementation across five age groups. Significant age-related differences were reported for Use of Environment-friendly

Materials and Facilities ($\chi^2 = 15.61$, df = 4, p = 0.004) and Environmental Education and Initiatives ($\chi^2 = 19.52$, df = 4, $p < 0.001$). In contrast, the comparisons for Waste Management ($\chi^2 = 6.84$, df = 4, p = 0.144), Conservation of Natural Resources ($\chi^2 = 4.23$, df = 4, p = 0.376), and Community Participation ($\chi^2 = 8.63$, df = 4, p = 0.071) did not reach the 0.05 significance threshold.

The results demonstrate age-group variation in perceptions of environment-friendly materials and environmental education, but not a statistically detected difference in the remaining three dimensions. The omnibus tests identified overall age-group differences but did not establish which specific age categories differed or provided higher ratings. The comparatively small numbers of older respondents also provide important context for the interpretation of age-related patterns.

Wang et al. (2023) reported that age was relevant to some residents' perceptions of environmentally responsible behavior in an ecotourism setting, whereas Dela Cruz et al. (2024) reported a different age-related pattern in their Philippine tourist sample. These findings illustrate that demographic associations may depend on the outcome measured and the context rather than follow a uniform pattern. Lukoseviciute et al. (2024) also emphasized the importance of incorporating diverse stakeholder perspectives into destination planning. In Siargao, accessible site-based demonstrations, straightforward environmental guidelines, and learning opportunities suited to different participants could help build a shared understanding of materials, facilities, and environmental initiatives. The present findings identify two dimensions warranting attention to age-group variation without establishing its causes.

3.6. Differences in Eco-tourism Perceptions by Sex

Mann-Whitney U tests compared the perceptions of 84 male and 116 female respondents across the five dimensions. None of the comparisons was statistically significant at $\alpha = 0.05$: Waste Management (U = 4,267, p = 0.326), Conservation of Natural Resources (U = 4,564, p = 0.828), Use of Environment-friendly Materials and Facilities (U = 4,374, p = 0.480), Environmental Education and Initiatives (U = 4,153, p = 0.201), and Community Participation (U = 4,437, p = 0.585). Thus, the analysis did not detect sex-based differences in reported eco-tourism implementation among the respondents. The absence of statistically significant differences does not prove that the two groups had identical perceptions, that sex is irrelevant in all tourism contexts, or that their environmental experiences were necessarily the same. Wang et al. (2023) likewise reported that gender differences did not affect the particular environmentally responsible behavior perceptions they studied among residents and tourists. Dela Cruz et al. (2024) also reported nonsignificant sex-based differences for several sustainability perceptions in a Philippine ecotourism setting. Although these studies considered somewhat different measures, they provide recent points of comparison for the present nonsignificant results. The practical implication is to continue providing fair access to environmental learning, consultation, and participatory sustainability activities across sexes, with attention to individual needs rather than assumptions about group characteristics. In synthesis, no statistically significant differences by sex emerged across any of the five eco-tourism practice dimensions in the sample.

3.7. Differences in Eco-tourism Perceptions by Civil Status

Kruskal-Wallis tests examined perceived implementation across the four recorded civil-status categories. None of the five dimensions showed a statistically significant difference: Waste

Management ($\chi^2 = 4.55$, df = 3, p = 0.208), Conservation of Natural Resources ($\chi^2 = 5.27$, df = 3, p = 0.153), Use of Environment-friendly Materials and Facilities ($\chi^2 = 1.83$, df = 3, p = 0.609), Environmental Education and Initiatives ($\chi^2 = 4.07$, df = 3, p = 0.253), and Community Participation ($\chi^2 = 1.96$, df = 3, p = 0.581). Each p-value exceeded $\alpha = 0.05$. These findings indicate that the reported analyses did not detect differences by civil status in the measured practice ratings. They should nevertheless be interpreted cautiously because the groups varied substantially in size: 154 respondents were single, whereas only seven were widowed and one was separated or divorced. The statistical findings supported interpretation of the overall civil-status comparisons but did not establish specific differences between individual categories. A nonsignificant result also does not establish that personal or family circumstances have no practical relevance to environmental engagement. Stakeholder participation and accessibility provided a relevant context for interpreting the findings concerning civil-status differences in eco-tourism perceptions. Iqbal et al. (2022) emphasized meaningful participation in sustainable tourism, and the Global Sustainable Tourism Council (2026) calls for community engagement in destination planning and management. Neither source establishes a direct civil-status effect; instead, both support the practical importance of making sustainability programs accessible to participants with varied personal circumstances. Accordingly, the present data support inclusive program access while indicating no statistically significant civil-status differences in the five surveyed dimensions.

3.8. Differences in Eco-tourism Perceptions by Nationality Category

Kruskal-Wallis tests compared the Asian (n = 95), European (n = 75), and American (n = 30) categories recorded in the survey. Statistically significant differences appeared for all five dimensions: Waste Management ($\chi^2 = 18.0$, df = 2, $p < 0.001$), Conservation of Natural Resources ($\chi^2 = 27.5$, df = 2, $p < 0.001$), Use of Environment-friendly Materials and Facilities ($\chi^2 = 27.8$, df = 2, $p < 0.001$), Environmental Education and Initiatives ($\chi^2 = 22.4$, df = 2, $p < 0.001$), and Community Participation ($\chi^2 = 22.6$, df = 2, $p < 0.001$). The largest test statistics were recorded for environment-friendly materials and facilities and conservation of natural resources. These are omnibus comparisons; they do not indicate which pairs of groups differed or which category rated an individual domain more favorably. The pattern shows that perceptions differed across the three broad nationality categories in all evaluated aspects of eco-tourism implementation. Cultural background, prior exposure, or expectations about environmental standards could be relevant contextual considerations, but these possibilities were not measured or tested directly in the study. The findings should not be interpreted as evidence that members of any category possess particular environmental attitudes or behave in a predetermined way. The regional categories themselves also provide limited information about individual nationality or experience. Iqbal et al. (2022) highlighted stakeholder engagement as integral to sustainable tourism, while Lukoseviciute et al. (2024) showed how stakeholders with different perspectives can contribute to destination planning. The Global Sustainable Tourism Council (2026) similarly emphasizes effective visitor information and participation in destination management. These sources support the practical recommendation that tourism sites provide clear, consistent, locally grounded information about waste disposal, resource conservation, permitted materials, environmental education, and participation opportunities, with room for feedback from diverse respondents. The present results establish the presence of nationality-category variation in perceptions, not its specific direction or explanation.

Overall, the study documented favorable perceptions of the implementation of five eco-tourism dimensions, all within the implemented rating category, alongside favorable perceptions of environmental sustainability. All practice dimensions were positively and significantly associated with sustainability ratings. Differences in implementation perceptions were detected in two dimensions across age groups and in all five across nationality categories, whereas the sex and civil-status comparisons were not statistically significant. Taken together, these results support inclusive, coordinated eco-tourism management and continued monitoring, while their interpretation remains limited to the respondents' assessments and the reported statistical analyses.

4. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that eco-tourism practices across four selected tourism sites in Siargao Island fell within the implemented rating category, while the 200 participating tourists, local residents, and tourism staff reported favorable perceptions of environmental sustainability. Waste management and community participation emerged as relatively stronger practices, whereas conservation of natural resources received the lowest implementation rating, indicating an area requiring greater attention. All five dimensions of eco-tourism practices demonstrated positive and statistically significant relationships with perceived environmental sustainability, with environmental education and initiatives showing the strongest association. These findings emphasized the importance of coordinated environmental practices in relation to favorable sustainability perceptions without establishing causal relationships. Perceptions differed significantly across the recorded nationality categories in all five dimensions and across age groups in two dimensions, whereas differences by sex and civil status were not statistically significant. Overall, the study provided site-specific evidence concerning eco-tourism implementation, perceived environmental sustainability, and demographic variations within Siargao Island's selected tourism destinations.

Tourism site operators and managers should prioritize natural resource conservation by establishing regular site assessments and measurable environmental monitoring indicators while strengthening environmental education programs for visitors, personnel, and local residents. Existing waste management initiatives should be maintained and expanded through waste segregation, reduction, recycling, and appropriate disposal practices. Community participation should be strengthened by involving residents in conservation planning, implementation, monitoring, and decision-making. Considering the significant differences associated with age and nationality, tourism managers should provide inclusive training on environment-friendly materials and procedures and conduct consistent orientations concerning environmental regulations, cultural values, and sustainability objectives. Local government units should ensure uniform enforcement of environmental standards and provide appropriate financial and infrastructural support for conservation, waste management, and environmental education. Academic institutions should develop context-specific eco-tourism learning programs responsive to Siargao Island's environmental and community needs. Future researchers should examine long-term sustainability patterns, explore cultural and generational perspectives, and compare perceived sustainability with actual environmental measurements.

The study was limited to 200 respondents selected through convenience sampling from four tourism sites in Siargao Island. Consequently, the findings reflected the perceptions of participating tourists, local residents, and tourism staff and should not be generalized to all tourism destinations or populations. The assessment focused on perceived eco-tourism practices and environmental sustainability rather than direct environmental measurements. Furthermore, the statistically significant relationships identified did not establish causation.

Future investigations may involve broader respondent groups and additional tourism sites, incorporate measurable environmental indicators, and employ qualitative and follow-up approaches to examine sustainability practices and demographic differences more comprehensively.

5. REFERENCES

Andrade, C. (2021). The inconvenient truth about convenience and purposive samples. Indian Journal of Psychological Medicine, 43(1), 86–88. https://doi.org/10.1177/0253717620977000

Chicco, D., Sichenze, A., & Jurman, G. (2025). A simple guide to the use of Student's t-test, Mann-Whitney U test, Chi-squared test, and Kruskal-Wallis test in biostatistics. BioData Mining, 18, Article 56. https://doi.org/10.1186/s13040-025-00465-6

Dela Cruz, D., Cabiles, D., Velasco, L. C., & Dela Cruz, G. H. (2024). What you see is what you get: Sustainable tourism practices and behavioral intention in ecotourism of Bongabon, Nueva Ecija, Philippines. International Journal of Research and Innovation in Social Science, 8(8), 1345–1365. https://doi.org/10.47772/IJRISS.2024.8080100

Department of Environment and Natural Resources. (2024). SIPLAS biophysical monitoring of marine protected areas [Technical report]. FASPS E-Library. https://faspselib.denr.gov.ph/Materials/Detail/f8f41995-667b-4f10-8de2-95f17cbc521d

Department of Environment and Natural Resources. (2025). Siargao Island Protected Landscape and Seascape: Biodiversity, ecological integrity, and conservation [Information, education, and communication material]. FASPS E-Library. https://faspselib.denr.gov.ph/Materials/Detail/aa68c47c-a95d-4139-8c01-c363c8c58c7b

Fabillar, J. P., Uy, J. J. O., & Daguinod, M. C. (2024). Exploring the knowledge, attitudes, and practices (KAP) of locals towards ecotourism in Samar, Philippines: Insights for sustainable development. Ho Chi Minh City Open University Journal of Science – Social Sciences, 15(3), 132–141. https://doi.org/10.46223/HCMCOUJS.soci.en.15.3.3528.2025

Global Sustainable Tourism Council. (2026). GSTC destination standard. https://www.gstc.org/gstc-criteria/gstc-destination-criteria/

Hafezi, F., Bijani, M., Gholamrezai, S., Savari, M., & Panzer-Krause, S. (2023). Towards sustainable community-based ecotourism: A qualitative content analysis. Science of the Total Environment, 891, Article 164411. https://doi.org/10.1016/j.scitotenv.2023.164411

Iqbal, A., Ramachandran, S., Siow, M. L., Subramaniam, T., & Afandi, S. H. M. (2022). Meaningful community participation for effective development of sustainable tourism: Bibliometric analysis towards a quintuple helix model. Journal of Outdoor Recreation and Tourism, 39, Article 100523. https://doi.org/10.1016/j.jort.2022.100523

Kim, J., Kim, D. H., & Kwak, S. G. (2024). Comprehensive guidelines for appropriate statistical analysis methods in research. Korean Journal of Anesthesiology, 77(5), 503–517. https://doi.org/10.4097/kja.24016

Lukoseviciute, G., Henriques, C. N., Nobre Pereira, L., & Panagopoulos, T. (2024). Participatory development and management of eco-cultural trails in sustainable tourism destinations. Journal of Outdoor Recreation and Tourism, 47, Article 100779. https://doi.org/10.1016/j.jort.2024.100779

Meschini, M., Machado Toffolo, M., Caroselli, E., Franzellitti, S., Marchini, C., Prada, F., Boattini, A., Brambilla, V., Martinez, G., Prati, F., Simoncini, G., Visentin, M., Airi, V., Branchini, S., & Goffredo, S. (2021). Educational briefings in touristic facilities promote tourist sustainable behavior and customer loyalty. Biological Conservation, 259, Article 109122. https://doi.org/10.1016/j.biocon.2021.109122

Republic of the Philippines. (2001). Republic Act No. 9003: Ecological Solid Waste Management Act of 2000. https://issuances-library.senate.gov.ph/legislative%2Bissuances/Republic%20Act%20No.%209003

Sakcharoen, T., Niyommaneerat, W., Faiyue, B., & Silalertruksa, T. (2023). Low-carbon municipal solid waste management using bio-based solutions and community participation: The case study of cultural tourism destination in Nan, Thailand. Heliyon, 9(11), Article e22025. https://doi.org/10.1016/j.heliyon.2023.e22025

Serrona, K. R. B., Yu, J., & Camarin, M. J. A. (2022). Addressing marine litter through sustainable tourism: The case of the Siargao Islands in the southern Philippines (ADBI Working Paper No. 1302). Asian Development Bank Institute. https://www.adb.org/publications/addressing-marine-litter-through-sustainable-tourism-the-case-of-the-siargao-islands-in-the-southern-philippines

Stratton, S. J. (2023). Population sampling: Probability and non-probability techniques. Prehospital and Disaster Medicine, 38(2), 147–148. https://doi.org/10.1017/S1049023X23000304

Taufique, K. M. R., Sabbir, M. M., & Rabbanee, F. K. (2026). A guide to key decision criteria for Likert-scale use in survey research. Global Business and Organizational Excellence, 45(5), 493–508. https://doi.org/10.1002/joe.70032

Tsai, F. M., Bui, T.-D., Tseng, M.-L., Lim, M. K., & Tan, R. R. (2021). Sustainable solid-waste management in coastal and marine tourism cities in Vietnam: A hierarchical-level approach. Resources, Conservation and Recycling, 168, Article 105266. https://doi.org/10.1016/j.resconrec.2020.105266

United Nations Department of Economic and Social Affairs. (2025). The Sustainable Development Goals report 2025. United Nations. https://unstats.un.org/sdgs/report/2025/

United Nations Environment Programme. (2021). From pollution to solution: A global assessment of marine litter and plastic pollution. https://www.unep.org/en/publications/report/pollution-solution-global-assessment-marine-litter-and-plastic-pollution

Wang, J., Dai, J., Gao, W., Yao, X., Dewancker, B. J., Gao, J., Wang, Y., & Zeng, J. (2024). Achieving sustainable tourism: Analysis of the impact of environmental education on tourists' responsible behavior. Sustainability, 16(2), Article 552. https://doi.org/10.3390/su16020552

Wang, Y., Zhao, R., Yan, Z., Wang, M., Pan, Y., & Wu, R. (2023). A comparative study of environmental responsibility behavior in ecotourism from the perceptions of residents and tourists: A case of Qilian Mountains National Park in China. PLOS ONE, 18(2), Article e0281119. https://doi.org/10.1371/journal.pone.0281119

World Commission on Environment and Development. (1987). Our common future. Oxford University Press. https://www.unccd.int/resources/unccd-library/our-common-future

Yu, Y., Chen, L., Qiu, H., Xiao, X., & Li, M. (2024). Can tourists be educated? The effect of tourist environmental education on environmentally responsible behavior. Asia Pacific Journal of Tourism Research, 29(1), 113–125. https://doi.org/10.1080/10941665.2024.2316602

Zimba, O., & Gasparyan, A. Y. (2023). Designing, conducting, and reporting survey studies: A primer for researchers. Journal of Korean Medical Science, 38(48), Article e403. https://doi.org/10.3346/jkms.2023.38.e403