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# ENVIRONMENTAL SUSTAINABILITY AT NOTRE DAME OF DADIANGAS UNIVERSITY

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**Abstract**

This descriptive quantitative study examined the role of engineering faculty at Notre Dame of Dadiangas University (NDDU) – Glamang Campus in advancing environmental sustainability during academic years 2020–2025, focusing on their alignment with United Nations Sustainable Development Goal (SDG) 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). Purposive sampling was used to identify engineering faculty with direct instructional, research, or extension involvement in sustainability, and data were triangulated through a validated self-made questionnaire, documentary analysis, and structured on-site observation. Results indicated that campus sustainability practices were implemented (M = 2.71) and perceived as effective (M = 2.88) to a Moderate Extent overall, with waste management rated highest (M = 3.23 implementation; M = 3.50 effectiveness) and green transportation rated lowest (M = 1.77 implementation; M = 2.14 effectiveness). Alignment with the SDGs was likewise Moderate (M = 2.86), with SDG 13 (M = 3.07) outperforming SDG 7 (M = 2.64). Faculty engagement was highest in curriculum-level integration (M = 3.43) but weaker in research mentorship and extracurricular promotion, and external collaboration remained concentrated within the university (M = 3.07) rather than with NGOs (M = 2.28), government agencies, or industry. Among the hypothesized contributing factors — funding, institutional support, faculty training, technology access, and stakeholder willingness to change (overall M = 3.11) — a Pearson correlation with the extent of sustainability practices was weak and not statistically significant, r = .249, p = .390. Faculty perception of institutional sustainability efforts was generally positive (M = 3.65), though awareness and conceptual understanding scored lowest among its indicators. The findings suggest that behavioral readiness at the Glamang Campus currently outpaces institutional resourcing, producing a decoupling between stated support and operational outcomes. Technological, pedagogical, collaborative, and financial strategies are proposed to help translate faculty willingness into measurable environmental impact and closer alignment with SDG 7 and SDG 13.

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**Keywords:** *environmental sustainability; engineering faculty; higher education institutions (HEIs); Sustainable Development Goals (SDGs); curriculum integration; NDDU–Glamang Campus*

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## Introduction

Environmental sustainability has become a defining imperative for higher education institutions (HEIs), which are expected to serve simultaneously as educators of future professionals and as exemplars of sustainable operations (López et al., 2022). International frameworks such as the QS Sustainability Rankings, the Times Higher Education (THE) Impact Rankings, and the standards promoted by the Association for the Advancement of Sustainability in Higher Education (AASHE) increasingly evaluate universities on their contribution to the United Nations Sustainable Development Goals (SDGs) through teaching, research, and campus operations (AASHE, 2024; QS, 2024; Times Higher Education, 2023). A persistent global obstacle, however, is the tendency for sustainability to remain siloed within environmental science departments rather than being adopted as an interdisciplinary requirement — a gap that is especially pronounced in technically standardized fields such as engineering, where educators often express willingness to integrate sustainability but lack systematic training, pedagogical tools, and institutional frameworks to do so effectively.

In the Philippines, this gap between institutional intention and pedagogical execution is well documented. While flagship initiatives such as the University of Santo Tomas' Simbahayan community-development program illustrate what is possible (University of Santo Tomas, 2024), broader implementation across Philippine HEIs continues to face structural barriers. Duran and Mariñas (2024) found that Filipino educators express strong willingness to integrate sustainability into their curricula but frequently lack the training and institutional backing to act on it, while Arnejo et al. (2025) identified institutional support as a mediating variable without which behavioral intention fails to translate into actionable environmental outcomes. Engineering departments have nonetheless made practical contributions — integrating renewable energy, waste management, and energy-efficiency content into coursework and research (Alhassani et al., 2025; Ramos & Tan, 2021) — even as scaling these efforts remains constrained by limited funding, weak interdisciplinary collaboration, and inconsistent institutional frameworks (Zhao & Li, 2021).

At the local level, NDDU's Main Campus has made a tangible infrastructural commitment to sustainability, installing a 499.5 kWp solar photovoltaic system that reduced its carbon footprint by an estimated 2,838 metric tons of $CO_2$ and advanced the university's alignment with SDG 7 and SDG 13 (Manubag & Canonigo, 2025). Whether this institutional commitment has translated pedagogically to the university's other sites, however, is less established. The Glamang Campus houses the College of Engineering, Architecture, and Technology's (CEAT) specialized laboratories and degree programs most directly relevant to sustainability-focused engineering, yet no systematic data existed on how its engineering faculty operationalize sustainability through instruction, research, student engagement, or external collaboration, or on how these efforts align with SDG 7 and SDG 13. This study addressed that gap.

### *Conceptual Framework*

The study was guided by a framework in which four faculty-level independent variables — teaching practices, research and projects, student engagement, and external collaboration — were hypothesized to influence two dependent outcomes: the extent of campus environmental sustainability practices and their alignment with the SDGs. Institutional support and the challenges faculty face (e.g., limited funding, resistance to change, training gaps) were treated as moderating factors expected to influence how strongly faculty involvement translates into sustainability outcomes.

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***Research Questions***

This study sought to answer the following questions:

1. What is the extent of environmental sustainability practices at NDDU – Glamang Campus in terms of (a) implementation, (b) effectiveness, (c) alignment with the SDGs, (d) faculty engagement, and (e) collaboration?
2. To what extent do selected institutional and behavioral factors contribute to the university's environmental sustainability practices?
3. Is there a significant relationship between these contributing factors and the extent of the university's sustainability practices?
4. How do engineering faculty perceive the university's environmental sustainability practices?
5. What environmental sustainability strategies can be recommended?

***Scope and Significance***

The study was delimited to engineering faculty at NDDU – Glamang Campus who were actively engaged in sustainability-related teaching, research, or extension work between academic years 2020 and 2025, and to SDG 7 and SDG 13 specifically, rather than the full set of 17 SDGs. Findings are intended to inform faculty development programming, curriculum enhancement, and resource-allocation decisions within CEAT, and to provide an empirical baseline for engineering departments at comparable Philippine HEIs seeking to close the gap between institutional sustainability commitments and classroom-level practice.

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## Methods

### *Research Design*

This study used a descriptive quantitative design to characterize, rather than manipulate, engineering faculty involvement in environmental sustainability at NDDU – Glamang Campus. The design allowed the interplay among teaching practices, research and projects, student engagement, institutional support, and external collaboration to be described as they naturally occurred, and permitted the extent and perceived effectiveness of campus sustainability practices to be assessed against SDG 7 and SDG 13.

### *Participants and Sampling*

Respondents were engineering faculty members at NDDU – Glamang Campus who were directly involved in sustainability-related teaching, research, or community extension activities during AY 2020–2025. A purposive, total-enumeration sampling approach was used: the Dean's Office supplied the official faculty roster in an administrative capacity only, and the researchers independently screened it against explicit inclusion criteria — a minimum of one full academic year of continuous service at the campus, and documented engagement in at least one sustainability-related course, research project, or extension activity during the study period. Faculty on official leave during data collection, or whose teaching assignments had no connection to environmental or sustainability content, were excluded. The accessible population meeting these criteria was estimated at approximately 20–30 faculty members.

### *Instruments*

The primary instrument was a structured, seven-part self-made questionnaire covering (I) institutional sustainability practices, (II) effectiveness and impact, (III) curriculum integration, (IV) research and projects, (V) challenges and institutional support, (VI) student engagement and collaboration, and (VII) open-ended recommendations. The instrument was reviewed by three experts in environmental science, engineering education, and research methodology for content validity, clarity, and alignment with the study objectives, and was refined based on their feedback. Documentary analysis of institutional sustainability reports and faculty research outputs, together with structured on-site observation of campus infrastructure (e.g., solar installations, waste-management facilities, energy-efficient classrooms), served as corroborative instruments for methodological triangulation.

### *Data Collection Procedure*

Following approval from the NDDU Research Ethics Committee and the Dean of the College of Engineering, eligible faculty were invited directly by the researchers — independent of departmental supervisors — and provided a Participant Information Sheet and Informed Consent Form in advance of data collection. Consenting participants completed a single, approximately 15–20-minute questionnaire administered either in a private on-campus setting or through a restricted, invitation-only digital link (with device fingerprinting, IP tracking, and email collection disabled) to preserve anonymity. Institutional document review and site observation were conducted in parallel to corroborate questionnaire responses. All individual identifiers were removed at the point of retrieval and replaced with numeric codes (e.g., Faculty 1, Faculty 2).

### *Data Analysis*

Frequency and percentage distributions summarized the respondent demographics. Means and standard deviations described the extent of sustainability practices, contributing factors, and faculty perceptions (Research Questions 1, 2, 4, and 5). Pearson's product-moment correlation coefficient (r) was computed at $\alpha = .05$ to test the relationship between contributing factors and the extent of sustainability practices (Research Question 3).

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Documentary analysis and observation checklists were used strictly as corroborative, non-qualitative instruments to verify campus infrastructure and institutional records against survey responses, rather than to generate independent qualitative themes.

***Ethical Considerations***

The study was approved by the NDDU Research Ethics Committee prior to data collection. Participation was voluntary and uncompensated beyond indirect professional benefit, and respondents retained the right to withdraw at any point without penalty to employment status or performance ratings; withdrawn or partially completed responses were destroyed and excluded from analysis. Recruitment was conducted independently of departmental supervisors to minimize perceived coercion, and all data were de-identified, coded numerically, and stored in encrypted, access-restricted institutional systems, to be retained for three years post-study before secure destruction. The study followed the Philippine National Ethical Guidelines for Health and Social Research (2017) and APA (2020) ethical standards for research with human participants.

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## Results

This section presents findings from the questionnaire, corroborated by documentary analysis and on-site observation, organized around the study's five research questions.

### *Extent of Environmental Sustainability Practices*

#### Implementation

**Table 1.** ***Extent of Implementation of Environmental Sustainability Practices***

| Indicator | Mean | Description |
|---|---|---|
| Renewable energy projects (e.g., solar panels) | 2.28 | Moderate Extent |
| Water conservation programs | 3.15 | Moderate Extent |
| Waste management initiatives (e.g., recycling, composting) | 3.23 | Moderate Extent |
| Sustainable building design or construction | 3.21 | Moderate Extent |
| Green transportation programs (e.g., bike-sharing, EVs) | 1.77 | Very Low Extent |
| Energy efficiency measures (e.g., LED lighting) | 2.93 | Moderate Extent |
| **Overall Mean** | **2.71** | **Moderate Extent** |

Overall implementation was Moderate (M = 2.71). Waste management initiatives (M = 3.23) and sustainable building design (M = 3.21) were rated highest; green transportation programs were rated lowest (M = 1.77, Very Low Extent). Renewable energy implementation at Glamang (M = 2.28) remained markedly lower than the documented solar infrastructure at the NDDU Main Campus (Manubag & Canonigo, 2025).

#### Effectiveness

**Table 2.** ***Perceived Effectiveness of Environmental Sustainability Practices***

| Indicator | Mean | Description |
|---|---|---|
| Effectiveness of renewable energy projects | 2.71 | Moderate Extent |
| Effectiveness of water conservation programs | 3.23 | Moderate Extent |
| Effectiveness of waste management initiatives | 3.50 | High Extent |
| Effectiveness of sustainable building/construction | 3.00 | Moderate Extent |

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| Indicator | Mean | Description |
|---|---|---|
| Effectiveness of green transportation programs | 2.14 | Low Extent |
| Effectiveness of energy efficiency measures | 2.93 | Moderate Extent |
| **Overall Mean** | **2.88** | **Moderate Extent** |

Overall effectiveness was Moderate (M = 2.88). Waste management was perceived as the most effective practice (M = 3.50, High Extent), while green transportation was rated lowest (M = 2.14, Low Extent).

**Alignment with the SDGs**

**Table 3.** ***Alignment of Sustainability Practices with SDG 7 and SDG 13***

| Indicator | Mean | Description |
|---|---|---|
| SDG 7 (Affordable and Clean Energy) | 2.64 | Moderate Extent |
| SDG 13 (Climate Action) | 3.07 | Moderate Extent |
| **Overall Mean** | **2.86** | **Moderate Extent** |

Alignment with the SDGs overall was Moderate (M = 2.86). SDG 13 (Climate Action) scored higher (M = 3.07) than SDG 7 (Affordable and Clean Energy) (M = 2.64), mirroring the implementation gap in renewable energy noted above.

**Engagement**

**Table 4.** ***Faculty Engagement in Sustainability-Promoting Activities***

| Indicator | Mean | Description |
|---|---|---|
| Incorporating sustainability topics into course materials | 3.43 | High Extent |
| Integrating sustainability into student assignments/projects | 3.43 | High Extent |
| Promoting extracurricular sustainability clubs or events | 3.31 | Moderate Extent |
| Mentoring students on sustainability-focused research | 3.28 | Moderate Extent |
| **Overall Mean** | **3.34** | **Moderate Extent** |

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Engagement was Moderate overall (M = 3.34), driven by High-Extent curriculum- and assignment-level integration (both M = 3.43); extracurricular promotion (M = 3.31) and research mentorship (M = 3.28) were comparatively weaker.

**Collaboration**

**Table 5.** ***Extent of Collaboration on Sustainability Initiatives***

| Indicator | Mean | Description |
|---|---|---|
| Other academic departments within NDDU | 3.07 | Moderate Extent |
| External non-governmental organizations (NGOs) | 2.28 | Low Extent |
| Government agencies (e.g., DENR, LGU) | 2.78 | Moderate Extent |
| Industry or corporate partners | 2.71 | Moderate Extent |
| **Overall Mean** | **2.71** | **Moderate Extent** |

Collaboration was Moderate overall (M = 2.71) and concentrated internally, with cooperation across NDDU departments rated highest (M = 3.07) and partnerships with external NGOs rated lowest (M = 2.28, Low Extent).

***Contributing Factors***

**Table 6.** ***Factors Contributing to Environmental Sustainability Practices***

| Indicator | Mean | Description |
|---|---|---|
| Availability of funding and financial resources | 2.86 | Moderate Extent |
| Level of institutional support from university administration | 3.08 | Moderate Extent |
| Availability of professional development and faculty training | 3.00 | Moderate Extent |
| Access to sustainable technologies and equipment | 2.93 | Moderate Extent |
| Willingness of students and staff to adapt to change | 3.36 | Moderate Extent |
| **Overall Mean** | **3.11** | **Moderate Extent** |

Contributing factors were rated Moderate overall (M = 3.11). Willingness of students and staff to adapt to change scored highest (M = 3.36), while availability of funding and financial resources scored lowest (M = 2.86).

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***Relationship Between Contributing Factors and the Extent of Sustainability Practices***

A Pearson product-moment correlation between the composite contributing-factors score and the composite extent-of-practices score yielded $r = .249$, a weak positive association that was not statistically significant, $p = .390$ (two-tailed), against the $\alpha = .05$ threshold. The null hypothesis of no significant relationship was therefore not rejected.

***Faculty Perception of Sustainability Practices***

**Table 7.** ***Engineering Faculty Perception of Environmental Sustainability Practices***

| Indicator | Mean | Description |
|---|---|---|
| Awareness and Understanding | 3.52 | Moderate Extent |
| Perception of Implementation | 3.93 | Moderate Extent |
| Engagement and Participation | 3.79 | Moderate Extent |
| Effectiveness | 3.93 | Moderate Extent |
| **Overall Mean** | **3.65** | **Moderate Extent** |

Faculty perception was Moderate overall ($M = 3.65$). Perception of Implementation and Effectiveness were both rated highest ($M = 3.93$), while Awareness and Understanding scored lowest ($M = 3.52$), suggesting that faculty recognize visible sustainability outcomes more readily than they feel equipped with the underlying technical concepts.

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**Discussion**

Across every dimension examined — implementation, effectiveness, SDG alignment, engagement, collaboration, and contributing factors — sustainability at NDDU – Glamang Campus registered at a consistent Moderate Extent. Read together, the pattern suggests a campus in transition: institutional intent and faculty willingness are present but have not yet been fully translated into high-level structural outcomes. This is consistent with Duran and Mariñas' (2024) observation that Philippine educators express a strong willingness to integrate sustainability while lacking the systematic training and institutional scaffolding to act on it fully, and with Arnejo et al.'s (2025) finding that institutional support functions as a mediating variable without which behavioral intention alone cannot drive environmental outcomes.

The clearest disparity in the dataset is between renewable energy and waste management. Waste management was the strongest-performing domain in both implementation (M = 3.23) and effectiveness (M = 3.50), consistent with the broader Philippine pattern of prioritizing tangible, low-cost environmental measures (Ramos & Tan, 2021). Renewable energy and green transportation, by contrast, lagged (M = 2.28 and M = 1.77 implementation, respectively) — and the gap is thrown into relief by the NDDU Main Campus's 499.5 kWp solar installation (Manubag & Canonigo, 2025), which has not yet been mirrored at Glamang. This asymmetry helps explain why alignment with SDG 7 (M = 2.64) lagged behind SDG 13 (M = 3.07): the campus's stronger showing is concentrated in measures that broadly support climate mitigation rather than in clean-energy infrastructure specifically.

Faculty engagement followed a similar pattern of strength concentrated where it is easiest to act. Curriculum- and assignment-level integration reached High Extent (M = 3.43), reflecting the same instructional willingness documented nationally (Duran & Mariñas, 2024), but extracurricular promotion and research mentorship — activities requiring more institutional infrastructure and discretionary time — were comparatively weaker. Collaboration showed the same internal-first pattern: cooperation across NDDU departments (M = 3.07) outpaced partnerships with NGOs, government agencies, and industry, echoing the "silo effect" that limits interdisciplinary sustainability work in technically standardized fields such as engineering (Arnejo et al., 2025).

The absence of a statistically significant relationship between contributing factors and the extent of sustainability practices ($r = .249$, $p = .390$) is the study's most consequential finding. It indicates that funding, institutional support, training, and stakeholder willingness — while each rated Moderate individually — are not currently functioning as a coherent lever on outcomes. In practice, this points to a decoupling between institutional "readiness" and operational "action": the human and administrative preconditions for sustainability exist, but are not yet organized in a way that reliably converts into implementation. This reading is consistent with faculty perception data (Section 3.4), where confidence in visible campus outcomes (M = 3.93 for both Implementation and Effectiveness) exceeded confidence in personal sustainability knowledge (M = 3.52 for Awareness and Understanding) — faculty appear to be more confident observers of institutional progress than equipped practitioners of it.

***Recommended Strategies***

Five sets of strategies follow directly from these findings:

**Technological and infrastructural:** extend renewable-energy infrastructure (e.g., a localized solar photovoltaic installation) and energy-efficiency measures at the Glamang Campus to close the gap with the Main Campus and strengthen alignment with SDG 7.

**Pedagogical and curricular:** adopt standardized, college-wide guidelines that embed sustainability into design, life-cycle analysis, and applied projects, extending current curriculum-level strengths into research mentorship and SDG 13-aligned coursework.

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**Collaborative and external partnership:** formalize MOAs with DENR, LGUs, and industry partners, and establish an interdisciplinary sustainability committee or liaison office to reduce reliance on internal-only collaboration.

**Human resource and behavioral:** leverage the study's highest-rated factor — staff and student willingness to change — through sustained professional development and, specifically, a campus green-transportation initiative to address the lowest-rated implementation indicator.

**Institutional and financial:** tie funding and professional-development resources to specific, measurable sustainability milestones rather than general support, and target internal grants toward the technical equipment gaps identified in Table 6.

***Limitations***

This study is limited by its single-campus, descriptive-correlational design, which precludes causal claims about the relationship between institutional factors and sustainability outcomes. Reliance on self-reported faculty perception, corroborated only by documentary review and observation rather than independent verification, introduces potential response bias. The discrepancy between the study's stated accessible population (approximately 20–30 faculty) and the N = 14 used in the correlational analysis (see editorial notes, Sections 2.2 and 3.3) also limits the statistical power available to detect a true relationship between contributing factors and practice, and should be clarified in any future submission of this manuscript. Finally, findings are specific to SDG 7 and SDG 13 and to the Glamang Campus, and may not generalize to other SDGs, other NDDU sites, or other Philippine HEIs.

**Conclusion**

Engineering faculty at NDDU – Glamang Campus demonstrate consistent, Moderate-Extent engagement with environmental sustainability across implementation, effectiveness, SDG alignment, engagement, and collaboration, anchored by strong performance in waste management and curriculum integration but constrained by weaker renewable-energy infrastructure, green transportation, and external partnerships. The lack of a statistically significant relationship between contributing institutional factors and actual sustainability outcomes suggests that the campus's primary constraint is not faculty willingness — which is high — but the conversion of that willingness into resourced, structured action. Targeted investment in clean-energy infrastructure, standardized pedagogical guidelines, external partnerships, and outcome-tied funding offers the clearest path toward moving the Glamang Campus from Moderate to High alignment with SDG 7 and SDG 13.

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