

ENHANCING GREEN BUILDING AWARENESS AMONG PRACTITIONERS: THE ROLE OF UNIVERSITY IN PROMOTING SUSTAINABLE PRACTICES

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ABSTRACT: *The construction industry significantly influences the built environment and its sustainability. In recent years, "green building" practices have emerged as vital strategies to reduce the environmental impacts of construction. Despite their global significance, the adoption of green building practices in developing regions like Negros Oriental, Philippines, remains limited. This study assesses the awareness of Philippine green building requirements among construction practitioners in Negros Oriental. It explores the potential role of Negros Oriental State University (NORSU) in promoting sustainable construction practices locally. Using a quantitative research design, the study evaluated the awareness levels of construction practitioners. Findings reveal substantial disparities across occupational roles. Architects exhibited the highest awareness, especially in energy efficiency, water conservation, and material sustainability. Conversely, engineers and artisans were categorized as "Somewhat Aware" in most areas, indicating significant knowledge gaps, particularly among on-site professionals responsible for implementing green building strategies. The study underscores the importance of education and professional experience in fostering green building awareness. To bridge the identified gaps, the study recommends targeted training programs, capacity-building initiatives, and mentorship opportunities. Additionally, integrating green building concepts into academic curricula at institutions like NORSU can play a pivotal role in enhancing awareness and promoting sustainable practices within the local construction sector.*

Keywords: Green building, Sustainability, Awareness

1. INTRODUCTION

The construction industry plays a crucial role in shaping the built environment and its impact on sustainability.

In recent years, "green building" has gained significant attention to mitigate the environmental consequences of construction activities [1]. Green buildings aim to create structures that optimize the use of natural resources, minimize the negative impact on the environment, and provide a healthy and productive indoor environment for occupants [2]. However, the widespread adoption of green building practices remains a challenge, particularly in developing regions like Negros Oriental in the Philippines. Previous studies have highlighted the importance of green building awareness and its integration into construction industry practices. Practitioners, including architects, engineers, and contractors, play a pivotal role in driving the implementation of green building strategies. The existing literature on green building adoption in the Philippines has identified several barriers, such as a lack of awareness, limited access to green building materials, and perceived higher construction costs [3].

To address these challenges, the role of educational institutions, such as Negros Oriental State University, in promoting sustainable practices and enhancing green building awareness among industry practitioners becomes crucial. This research paper aims to assess the awareness of Philippine green building requirements among practitioners in the construction industry of Negros Oriental Province and to explore the potential contributions of Negros Oriental State University in fostering sustainable practices within the local construction sector. By examining the current state of green building awareness and the initiatives undertaken by the university, this study aims to provide valuable insights that can inform policymakers, industry stakeholders, and educational institutions in their efforts to advance green building adoption and promote environmental sustainability in the region.

2. REVIEW OF RELATED LITERATURE

The Role of University in Promoting Sustainable

Practices. Universities are crucial in promoting sustainable practices and enhancing green building awareness among practitioners such as architects, engineers, and artisans [4]; [5-7]. As institutions of higher education, universities can serve as role models by implementing sustainable practices on their campuses, which can inspire positive actions in society [4, 6]. Furthermore, universities can bridge the academic world with the private sector, government, and civil society organizations, facilitating the transfer of knowledge, technology, and best practices that support sustainable development [4, 5].

The level of awareness among practitioners regarding the Philippine Green Building requirements on energy efficiency, water efficiency, material sustainability, solid waste management, site sustainability, and Indoor Environmental Quality can be enhanced through the educational and research activities of universities [5; 8; 9]. Universities can equip future generations with the skills, knowledge, and understanding to address sustainability challenges and opportunities [5, [9]. They can also provide examples and use their expertise, capabilities, and leadership to influence stakeholders to adopt and model more sustainable practices [5, 6].

Furthermore, the implementation of sustainable development in various areas of university operations, such as management, education, university environment, engagement, and innovation, can lead to the best integrated results [10, 6]. Student satisfaction and participation in sustainability practices can also be enhanced through positive perceptions of university sustainability practices [11, 12]. Active participation of all stakeholders, including students, faculty, and university management, is crucial for the effectiveness and longevity of sustainable development practices [13, 14].

Universities can also contribute to the dissemination of

sustainability issues through various communication channels, such as social media platforms, which can facilitate the active involvement of stakeholders [12; 14]. Additionally, financial and institutional support from the government and university leadership can be important motivators for the adoption of sustainability practices [15].

The theoretical and conceptual frameworks highlight the pivotal role of universities in enhancing green building awareness and promoting sustainable practices among practitioners, through their educational, research, and community engagement activities, as well as their own sustainable campus operations and stakeholder engagement [10, 6].

Practitioners' Awareness of Green Building. The existing literature suggests that there is a general awareness of green building concepts and practices among construction industry professionals, including architects, engineers, and artisans, in various countries [18; 17; 26; 22;19]. However, the level of awareness and understanding of specific green building requirements and their implementation varies. Several studies have found that while there is awareness of the importance of green building, the efforts to actually implement and adopt green building practices are often lacking [18, 17; 23]. This has been attributed to factors such as the high cost of green building materials, the lack of availability of green building technologies, and insufficient knowledge and training among construction professionals [17; 21].

In the Philippine context, the construction industry has been adapting to the shift towards more sustainable practices, including the incorporation of green building elements [25]. However, the literature on the specific level of awareness of green building requirements among Philippine construction professionals is limited. Siman [25] suggests that the engineering and construction industry in the Philippines has started embracing and incorporating sustainable practices as the country moves towards a greener future. This indicates a growing awareness and interest in green building among Philippine construction professionals. To further enhance the implementation of green building in the Philippines, it is crucial to address the knowledge gaps and provide more training and capacity-building opportunities for architects, engineers, and artisans [17]. Improving the awareness and understanding of green building requirements and their benefits can lead to more effective collaboration and productivity in green housing and construction development [17].

Additionally, the development of green building policies, rating systems, and regulatory frameworks can also play a significant role in driving the adoption of green building practices in the Philippine construction industry [20];[24]. While there is a general awareness of green building concepts among construction professionals, the level of understanding and implementation of specific green building requirements varies across different countries, including the Philippines. Addressing the knowledge gaps, providing more training, and developing supportive policies and regulations can help to further enhance the adoption of green building practices in the Philippine construction industry. This is undergoing a shift towards green and sustainable practices [25]. This is driven by the government's plans to modernize the country's

infrastructure and the growing awareness of the environmental implications of construction activities [25]. However, the level of awareness and adoption of green building requirements among architects, engineers, and artisans in the Philippine construction industry varies.

In terms of energy efficiency, several studies have highlighted the importance of adopting energy-efficient strategies and renewable energy applications in building design to reduce greenhouse gas emissions and operational costs (Helal & Ismail, 2023). The integration of Building Information Modeling (BIM) technology has also been shown to increase the adoption rate of green building materials in construction projects [28].

Regarding water efficiency, the Philippines is a tropical country with abundant rainfall, and there is a growing trend of implementing rainwater harvesting systems in high-rise buildings to reduce water waste and mitigate flooding (Andres & Loretero, 2021). However, the contamination of water sources, such as surface waters and groundwater, with coliforms and other pollutants remains a concern (Cambarihan et al., 2022).

In the area of material sustainability, the use of Philippine natural zeolites for the adsorption of pollutants, such as arsenic, has been explored. Additionally, the integration of green building materials and the use of BIM technology have been identified as strategies to increase the adoption of sustainable materials in construction projects [28].

For solid waste management, the construction industry in the Philippines is facing challenges related to the scarcity of natural resources and the environmental implications of construction waste [25].

Concerning site sustainability, the Philippines is prone to natural disasters, such as typhoons, floods, and landslides, which can impact the environment and water sources. The use of GIS technology for mapping local climate zones has been explored as a tool to support sustainable site planning.

Lastly, in terms of indoor environmental quality, studies have highlighted the importance of considering factors such as thermal comfort, air quality, and occupant satisfaction in green building design [27]. However, the level of awareness and implementation of these strategies among architects, engineers, and artisans in the Philippine construction industry is not well-documented.

With growing awareness and adoption of green building practices in the Philippine construction industry, there are still challenges and opportunities for improvement, particularly in the areas of water efficiency, material sustainability, solid waste management, site sustainability, and indoor environmental quality. Further research and targeted initiatives are needed to enhance the level of awareness and implementation of green building requirements among architects, engineers, and artisans in the Philippines.

3. METHODOLOGY

This study employed a quantitative research design to evaluate the awareness of green building requirements among construction practitioners in Negros Oriental, Philippines, representing the broader construction industry in the country. A purposive sampling method was used to select participants, including architects, engineers, and artisans, ensuring

representation across key occupational roles. Data were collected using a structured questionnaire that assessed practitioners' awareness of essential green building requirements such as energy efficiency, water conservation, material sustainability, solid waste management, site sustainability, and indoor environmental quality. Descriptive statistics, including mean scores and standard deviations, were used to summarize awareness levels, while analysis of variance

(ANOVA) tested for significant differences among occupational groups.

Ethical standards were rigorously upheld throughout the study. Informed consent was obtained from all respondents, and their confidentiality and anonymity were strictly protected. The study protocol received institutional review board approval, ensuring ethical compliance. This systematic and statistically driven approach provided comprehensive insights into the awareness levels of construction practitioners regarding green building practices. The findings serve as a foundation for targeted interventions and policy recommendations to promote sustainable construction practices in Negros Oriental and other urban contexts in the Philippines.

RESULTS AND DISCUSSION

Profile of the Practitioners. The study explores the awareness and practice of Green Building requirements

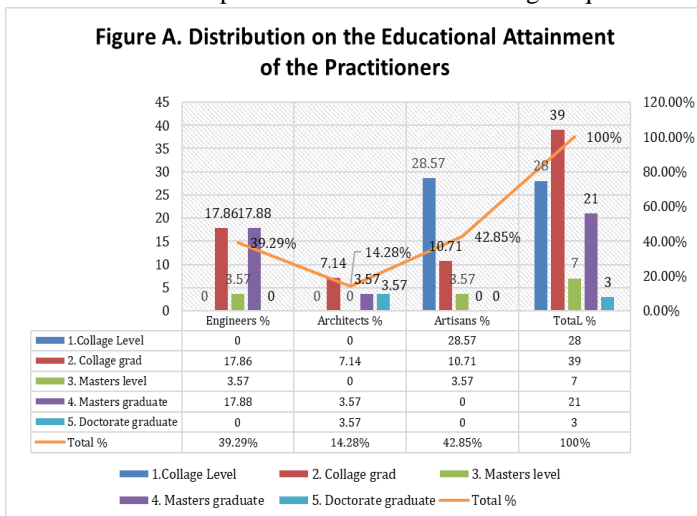
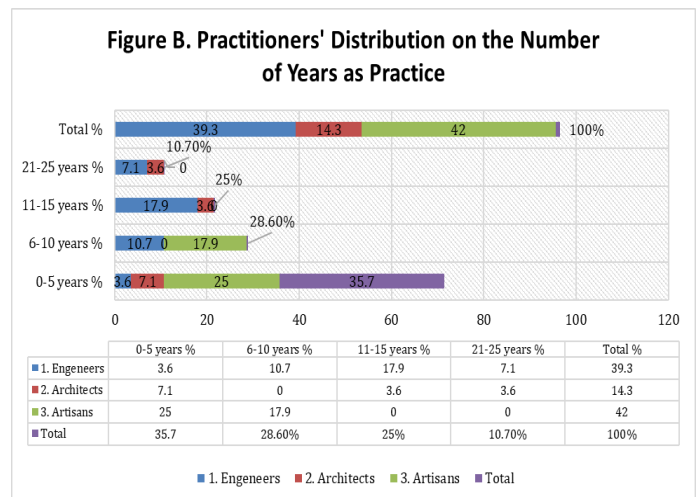


Figure A is on the distribution of educational attainment among practitioners in the building construction industry in Negros Oriental revealing a diverse range of qualifications, with a notable proportion holding college-level or college-graduate degrees. Of particular interest is the presence of practitioners with advanced degrees, particularly in engineering and architecture, which reflects a growing trend toward professional development within the industry. This trend is significant, as research consistently links higher educational qualifications to greater awareness and the ability to effectively implement green building practices. For instance, studies have shown that individuals with advanced degrees, such as those in engineering and architecture, are more likely to engage with and apply sustainable construction techniques. As such, the increasing prevalence of advanced

educational qualifications among construction professionals signals positive shifts toward enhanced competence in sustainable construction practices, which is critical for the continued advancement of the field.

Experience among these practitioners in Negros Oriental's building construction industry reveals a broad spectrum of experience levels, ranging from young professionals with 0-5 years of experience to seasoned experts with 11-25 years of practice. Notably, the 0-5-year experience group consists predominantly of artisans, with a few architects and engineers, indicating that the building sector is attracting a significant influx of new entrants. This emerging trend presents a valuable opportunity for introducing green building principles early in the careers of these professionals, which could foster a more sustainable approach to construction from the outset.

Conversely, a substantial proportion of professionals, particularly engineers and architects, possess 11-25 years of experience. This veteran cohort brings a wealth of expertise that could be instrumental in mentoring younger professionals. Their established knowledge positions them well to influence the integration of green building practices within the industry by guiding newcomers in adopting sustainable methods. Such mentoring can play a pivotal role in advancing the overall awareness and implementation of sustainable building solutions in the region. This dual dynamic of new entrants and experienced professionals underscores the importance of fostering green building awareness and facilitating knowledge transfer across varying levels of experience, ensuring the long-term sustainability of the industry. Figure B presents the distribution of the practitioners.

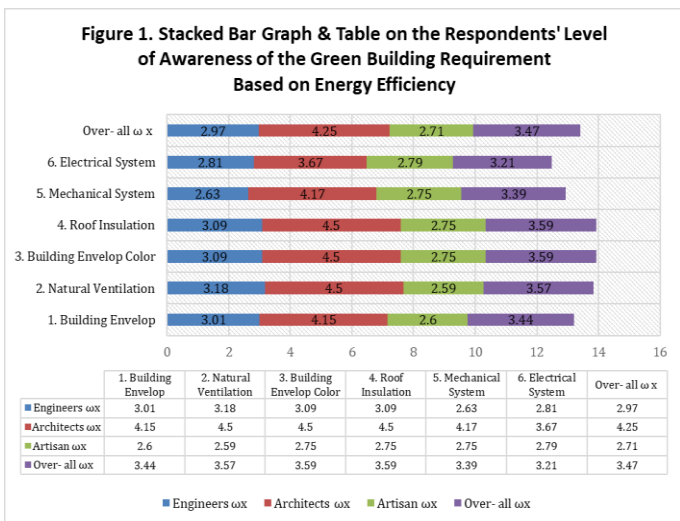


These findings underscore the importance of both education and experience in shaping practitioners' awareness and practice of green building. Targeted interventions, such as workshops and awareness campaigns, should be designed to address both new entrants and more experienced professionals to ensure the broad adoption of sustainable construction methods. The educational and professional experience profiles suggest that targeted interventions, such as workshops and awareness campaigns, should be designed to address both new entrants and more experienced

professionals to ensure the broad adoption of sustainable construction methods.

Practitioners’ awareness of the Green Building requirements. The study highlights notable variations in the awareness of green building requirements among construction practitioners in Negros Oriental, Philippines, demonstrating the significance of occupational roles in shaping knowledge and practices in sustainable construction. In the distribution, the architects emerged as the most informed group, categorized as "Extremely Aware" ($\omega x = 4.25$), particularly regarding energy efficiency—a cornerstone of green building design. This heightened awareness reflects their integral role in the conceptualization and integration of energy-efficient technologies and strategies, underpinned by their specialized expertise and involvement in sustainable design processes. The engineers and artisans rated as "Somewhat Aware" ($\omega x = 2.97$ and $\omega x = 2.71$, respectively), presented a more concerning awareness disparity. This suggests challenges in translating energy-efficient designs into actionable practices during construction, which may stem from limited exposure to or training in green building methodologies. The summary in Figure 1 underscores the need for tailored interventions targeting engineers, architects, and artisans.

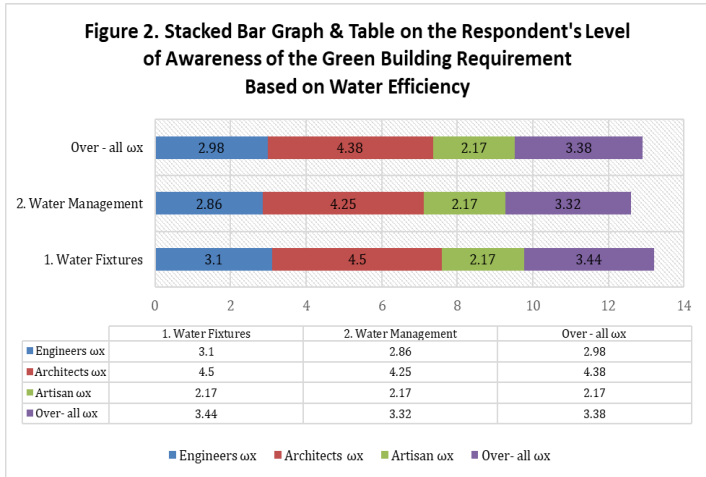
and artisans displayed comparatively lower awareness, categorized as "Somewhat Aware" ($\omega x = 2.98$ and $\omega x = 2.17$, respectively). The significantly lower awareness among artisans indicates potential deficiencies in exposure to or training on water conservation practices at the operational level. This disparity underscores a gap in the dissemination of water efficiency knowledge from design professionals to on-site workers, which could impede the practical implementation of water-saving strategies during construction.



Legend: Scale
4.21 - 5.00
3.41 - 4.20
2.61 - 3.40
1.81 - 2.60
1.00 - 1.80

Verbal Description
Extremely Aware (EA)
Moderately Aware (MA)
Somewhat Aware (SoA)
Slightly Aware (SeA)
Not at all Aware (NA)

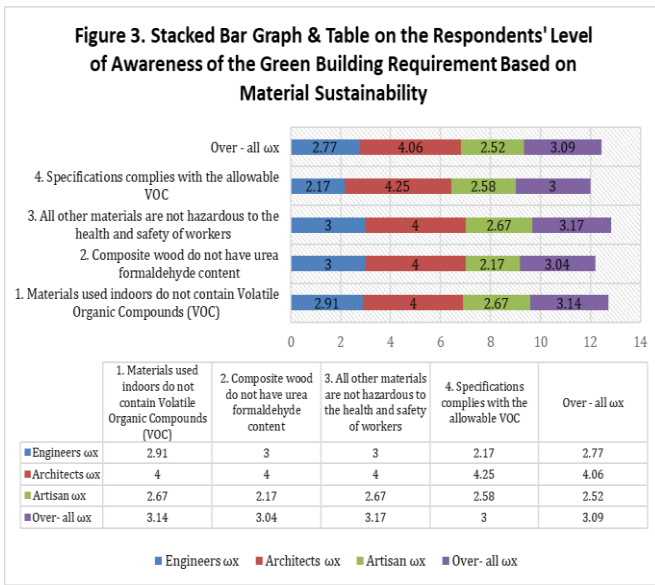
The quantitative findings depicted in Figure 2 emphasize the importance of targeted interventions. This reveals significant variations in awareness levels regarding water efficiency among construction practitioners with notable discrepancies across occupational roles. Architects demonstrated the highest awareness, rated as "Extremely Aware" ($\omega x = 4.38$), emphasizing their critical role in incorporating water conservation measures during the design phase. Engineers



Legend: Scale
4.21 - 5.00
3.41 - 4.20
2.61 - 3.40
1.81 - 2.60
1.00 - 1.80

Verbal Description
Extremely Aware (EA)
Moderately Aware (MA)
Somewhat Aware (SoA)
Slightly Aware (SeA)
Not at all Aware (NA)

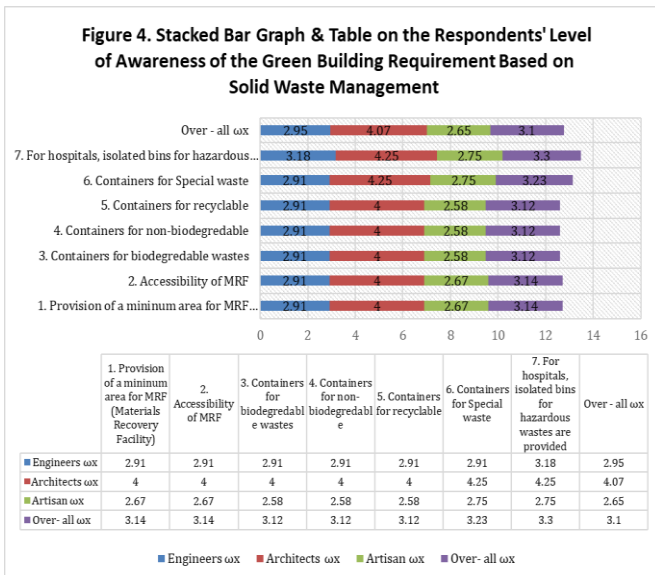
Detailed in Figure 3 is the illustration of the role-specific awareness levels of the practitioners. The study highlights varying levels of awareness regarding material sustainability among construction practitioners in Negros Oriental, Philippines, revealing significant disparities tied to occupational roles. Architects demonstrated the highest level of awareness, categorized as "Moderately Aware" ($\omega x = 4.06$), reflecting their pivotal role in selecting sustainable materials during the design process. In contrast, engineers, and artisans were rated as "Somewhat Aware" ($\omega x = 2.77$, and $\omega x = 2.52$, respectively), underscoring persistent knowledge gaps within the industry. This trend underscores the challenges of integrating sustainable materials into construction practices. Architects' relatively higher awareness can be attributed to their direct involvement in specifying materials that align with green building standards. However, the lower awareness among artisans who are responsible for on-site implementation highlights a critical need for targeted capacity-building initiatives. These could include workshops on material sustainability, certification programs, and collaboration across professional categories to ensure consistent understanding and application.



Legend: Scale
4.21 - 5.00
3.41 - 4.20
2.61 - 3.40
1.81 - 2.60
1.00 - 1.80

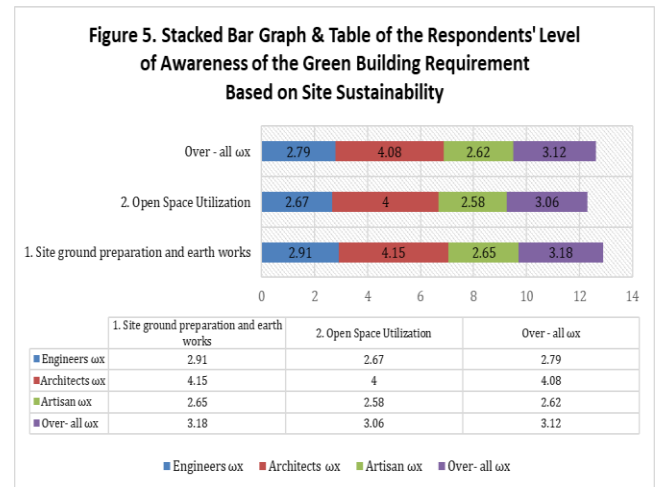
Verbal Description
Extremely Aware (EA)
Moderately Aware (MA)
Somewhat Aware (SoA)
Slightly Aware (SeA)
Not at all Aware (NA)

The study examines the awareness levels of construction professionals regarding solid waste management (SWM) as represented in Figure 4. Architects demonstrated the highest awareness level, classified as "Moderately Aware" ($\omega x = 4.07$), reflecting their understanding of SWM as a critical



Legend: Scale
4.21 - 5.00
3.41 - 4.20
2.61 - 3.40
1.81 - 2.60
1.00 - 1.80

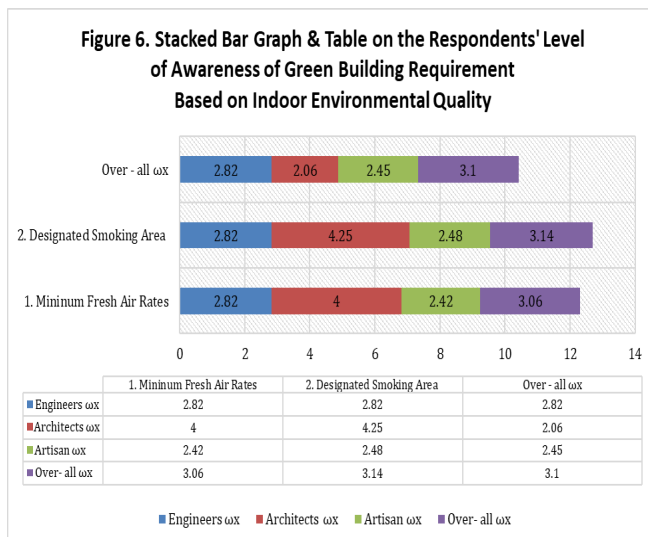
Verbal Description
Extremely Aware (EA)
Moderately Aware (MA)
Somewhat Aware (SoA)
Slightly Aware (SeA)
Not at all Aware (NA)



component of sustainable design and construction processes. Conversely, engineers and artisans were categorized as "Somewhat Aware" ($\omega x = 2.95$, and $\omega x = 2.65$, respectively). These results underscore a significant challenge:

The graphical representation in Figure 5 visually summarizes practitioners' awareness levels, reinforcing the necessity for role-specific initiatives. Architects were classified as "Moderately Aware" ($\omega x = 4.08$), reflecting their responsibility in integrating land use and environmental impact considerations during the planning phase. In contrast, engineers and artisans demonstrated lower awareness, categorized as "Somewhat Aware" ($\omega x = 2.79$, and $\omega x = 2.62$, respectively). This trend indicates that while architects possess moderate knowledge of site sustainability concepts, effective on-site implementation remains hindered by limited awareness among artisans. Site sustainability involves a multi-disciplinary approach, requiring collaboration across while architects may be more attuned to waste management principles, the implementation phase—largely handled by engineers, and artisans—suffers from inadequate awareness. Given that SWM is predominantly an on-site concern, targeted interventions are essential for enhancing the capacity of engineers and artisans, who are directly involved in waste segregation, recycling, and disposal during construction activities. Practical training, such as workshops and on-site demonstrations focusing on sustainable waste practices, could bridge these gaps. Additionally, integrating SWM protocols into contractual obligations and site supervision practices may improve adherence to sustainable waste practices across the workforce. roles to address issues such as ecological preservation, soil erosion control, and efficient land use. The lower awareness levels among artisans suggest a need for targeted interventions, such as professional development programs, field-specific workshops, and the incorporation of site sustainability guidelines in standard operating procedures. Enhancing knowledge at these levels is critical to translating sustainable designs into actionable practices during construction.

Finally, the quantitative findings detailed in Table 6, along with the graphical summary in Figure 6, underscore the need for targeted interventions to bridge this knowledge gap. Indoor environmental quality (IEQ) among construction



professionals in Negros Oriental, Philippines, highlighting notable role-based differences. Architects were classified as "Moderately Aware" ($\omega = 4.13$), indicating their familiarity with design considerations such as ventilation, acoustics, and lighting, which are essential for creating healthful and comfortable indoor spaces. In contrast, engineers and artisans were rated as "Somewhat Aware" ($\omega = 2.82$, and $\omega = 2.45$, respectively), underscoring limited knowledge and potential gaps in applying IEQ principles during construction. The disparity in awareness levels suggests that architects possess an adequate understanding of IEQ due to their design responsibilities, while on-site professionals might lack exposure to or training in IEQ-related practices. This gap could impede the effective realization of indoor environmental quality goals, particularly in projects where on-site execution significantly impacts ventilation systems, soundproofing, and natural lighting optimization.

The findings revealed the profile of the practitioners in the construction industry. The diverse range of qualifications among the practitioners, with a notable proportion holding college-level or college-graduate degrees, including advanced degrees in engineering and architecture. This trend is significant, as research has consistently linked higher educational qualifications to greater awareness and the ability to effectively implement green building practices. The analysis of experience levels among the practitioners showed a broad spectrum, ranging from young professionals with 0-5 years of experience to seasoned experts with 11-25 years of practice. The 0-5-year experience group consisted predominantly of artisans, with a few architects and engineers, indicating an influx of new entrants into the building sector. Conversely, a substantial proportion of professionals, particularly engineers and architects, possessed 11-25 years of experience, presenting an opportunity for mentoring younger professionals and facilitating the transfer of knowledge on sustainable construction methods.

The study further explored the practitioners' awareness of specific green building requirements, revealing notable variations across occupational roles. Architects emerged as the most informed group, categorized as "Extremely Aware" regarding energy efficiency, water efficiency, material

sustainability, solid waste management, site sustainability, and indoor environmental quality. In contrast, engineers and artisans displayed lower awareness levels, categorized as "Somewhat Aware" in most areas. This disparity underscores the need for targeted interventions to address the knowledge gaps, particularly among on-site professionals responsible for the practical implementation of green building strategies.

CONCLUSIONS

The study highlights the critical role of both education and experience in shaping practitioners' awareness to practice of green building in the Negros Oriental construction industry. The diverse educational profiles and varying levels of professional experience among the practitioners present both opportunities and challenges for the widespread adoption of sustainable construction methods.

The heightened awareness among architects, particularly in areas such as energy efficiency, water efficiency, and material sustainability, reflects their integral role in the conceptualization and integration of green building design principles. However, the lower awareness levels among engineers and artisans, who are responsible for the on-site implementation of these strategies, suggest a disconnect between design and execution. This gap underscores the need for targeted interventions to enhance the knowledge and skills of these practitioners, ensuring the effective translation of sustainable designs into practical construction practices.

As the influx of new entrants, predominantly artisans present a valuable opportunity to introduce green building principles early in their careers, fostering a more sustainable approach to construction from the outset. Simultaneously, the presence of experienced professionals, particularly engineers and architects, offers the potential for mentorship and knowledge transfer, which can further strengthen the industry's capacity to adopt and implement green building strategies.

RECOMMENDATIONS

The findings of this study underline the urgent need to enhance awareness and adoption of green building practices among construction practitioners in Negros Oriental. To address the knowledge gaps identified, it is recommended to establish targeted training and capacity-building programs. Workshops and hands-on training should focus on critical areas such as water efficiency, material sustainability, solid waste management, site sustainability, and indoor environmental quality. Additionally, mentorship initiatives pairing seasoned professionals, such as architects and senior engineers, with younger practitioners can facilitate knowledge transfer and foster best practices in sustainable construction. These efforts should be complemented by integrating green building concepts into the curricula of academic programs like engineering, architecture, and construction management to ensure that future industry professionals possess foundational knowledge and skills in sustainability practices.

Collaboration among industry associations, government agencies, and educational institutions is essential to establish continuous professional development programs that incentivize practitioners to update their expertise in green building. Advocacy for robust green building policies,

regulations, and incentive schemes is also necessary to create a supportive environment for adopting sustainable practices across the industry. Moreover, disseminating information and showcasing case studies of successful green building projects can inspire practitioners and highlight the tangible benefits of sustainability. Together, these initiatives can cultivate a culture of sustainability in the construction sector, bridging knowledge gaps, accelerating the adoption of green practices, and contributing to the environmental resilience and sustainability of Negros Oriental's built environment.

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