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AWARENESS, BARRIERS AND INTENTION TO IMPLEMENT SUSTAINABLE CONSTRUCTION AMONG CONSTRUCTION'S TEAM IN AN INDONESIAN STATE-OWNED CONSTRUCTION COMPANY

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Abstract:
The construction industry significantly impacts Indonesia's economic, social, and environmental development. Sustainable construction is the key to minimizing current and future environmental and social impact. This paper reports the results of a study about the correlation between sustainable construction (SC) awareness and intentions to implement sustainable construction in one Indonesian state-owned company. This entails identifying the current status of SC practices, the awareness level of construction teams, the intentions to implement SC and barriers to Implementing SC. After comprehensively reviewing the literature, the data is collected quantitatively through a questionnaire survey using random sampling techniques. The authors targeted 262 construction teams associated with the Indonesian state-owned construction company as the population and got the feedback as 266 completed questionnaires were received. The data was then analyzed through descriptive and Partial Least Square analysis using SmartPLS version 3.9.0. The main findings of this research are as follows: awareness level of SC in Indonesian state-owned construction companies is moderate level, and the intention to implement SC is high; awareness has no significant effect on the intention to implement SC, So the Indonesian Government should need more campaign and strategies to improve and encourage this concept; in order to be applied efficiently in future projects, it is because material, competence, cost, and time were found to be the main Barrier to implement SC on this study.

Keywords: Sustainable construction, intention to implement, barriers, awareness, Indonesian State-owned construction company
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INTRODUCTION

Infrastructure is critical to a country's development (Khan et al., 2022). It is an essential component of national development and can drive economic growth, both regionally and nationally (Ismail et al., 2017).

In Indonesia, the construction sector's role is strongly intertwined with employment, investment, infrastructure and building projects, reciprocal relationships with supporting sectors and facilitating the movement and growth of goods and services. The construction sector also supports equitable development in all sectors, including food security in each region, meeting national electricity and energy needs, improving education and health facilities, adequate road access for goods and services transportation, and increasing tourism attractiveness. Infrastructure development in Indonesia is one of the reasons why the construction sector's role in the Indonesian

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economy has grown in recent years. This can be seen in the construction sector's significant contribution to Gross Domestic Product (GDP), which reached 10,44% or Rp. 1.771.727 Billion, an increase from the previous year's Rp. 1.652.660 Billion (BPS, 2022).

Successful development is one of the critical factors in generating a better economy, which can improve community welfare and play a role in achieving long-term development (Shurrab et al., 2019). Sustainable development can be defined as development that allows the present to meet its own needs while also assisting future generations to meet theirs (WCED, 1987). Based on (Willar et al., 2021), the construction industries consume significant energy and natural resources.

The construction industry is responsible for 16% of water, 25% of timber, 40% of raw materials, and 32% of total energy consumption. In addition, the industry is responsible for approximately 40% of waste generation and one-third of carbon emissions (Serpell et al., 2013). Therefore, adopting a sustainability paradigm in the construction sector is critical, as it aims to reduce the industry's impact on the environment, society, and economy. In a previous study conducted by (Serik et al., 2020), the adverse effects of the construction industry on the environment and the population have become severe problems (Shashi et al., 2023). To address this situation and mitigate its consequences, the new concept of "sustainable construction" has emerged(Willar et al., 2021). This concept has become the new construction industry philosophy, introducing various enhancements to previous concepts, such as the use of highly environmentally friendly materials and resources, an improvement in the quality of the indoor environment, and the implementation of techniques to save resources and reduce waste consumption (Ismail et al., 2017).

Sustainable construction comes as a way of ensuring all activities in the term of construction are carried out sustainably, not only in the planning phase but also during the completion phases; in addition, sustainable construction also considers the economic and social factors and the environmental impacts (Ismail et al., 2017). As we know, the construction industry directly affects society, the environment, and economic matters; it has the most significant impact on sustainability compared to any other industrial sector. More than that, (Willar et al., 2021)have stated that the construction industry has a vital role in preserving the Indigenous environment through using resources, assets, and water. Hence, the industry significantly contributes to improving the quality of human life. The Indonesian Government has regulated the implementation of sustainable construction in the Regulation of the Minister of Public Works and Public Housing Number 9 of 2021 concerning Guidelines for Implementing Sustainable Construction (PERMEN 9/PUPR/2021). However, there are still gaps between regulations that have been issued and their implementation, so this research study aims to identify the following:

I. How deep is the project team's understanding of sustainable construction and the environmental impact of construction activities
II. What are the main potential barriers to implementing sustainable construction?
III. Is there any correlation between the project's team understanding of sustainable construction and the intention to implement sustainable construction

The research results will help state-owned construction companies increase awareness and minimize obstacles to implementing sustainable construction.

METHODS

This study runs a quantitative approach method by using a structured questionnaire distributed to construction professionals in one Indonesian State-Owned Construction Company, namely Project Managers, Site Engineering Managers, Office Engineers, and Site Administration Managers. Based on primary data from one Indonesian State-Owned Construction Company, 262 people will become the research population, so based on the Slovin formula regarding the known

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population, the author got 159 for the minimum number of respondents in this research (Author et al., 2023).

In this study, the author prepared a closed-end questionnaire using Google Form media (https://forms.gle/QGg2hZKnqS3mpfnQ7) that was divided into three sections (Appendix A). The first section presents the collection demographic of respondents, such as job position, time in current position, and work experience from the respondents. The second part consists of 10 multiple-choice questions to assess respondents' awareness level regarding sustainable construction practices and the impacts of construction on the environment. The last part consists of 6 questions with a Likert scale to determine respondents' intention to implement sustainable construction and one free text to capture the potential Barrier to adopting sustainable construction practices.

RESULT AND DISCUSSION

Respondent's Profile. Questionnaires were distributed to Indonesian state-owned construction company employees (Head Office, Business Unit and Project). Two hundred sixty-six respondents who participated in filling out the questionnaire were obtained. Based on the participants who filled out the questionnaire, they were segmented into 87.8% men, 12.4% women with an age range of 59.8% (26-35 years old), 25.2% (36-45 years old), 7.5% (> 46 years old) the rest of them were 46 years old and < 25 years old. Most respondents came from Business Units and Projects, with the majority being project teams (Project et al. Administration Manager, Office Engineer, and HSE officer). From the respondents, the author can get the data that the average score for respondents' awareness related to sustainable construction is 6 out of 10; the highest average score comes from the Business Unit (Building Division and Infrastructure 1 Division). After getting all the data from the questionnaire results, the author ran quantitative analyses using SmartPLS version 3.9.0 and got the structural model, as shown in Fig 1.

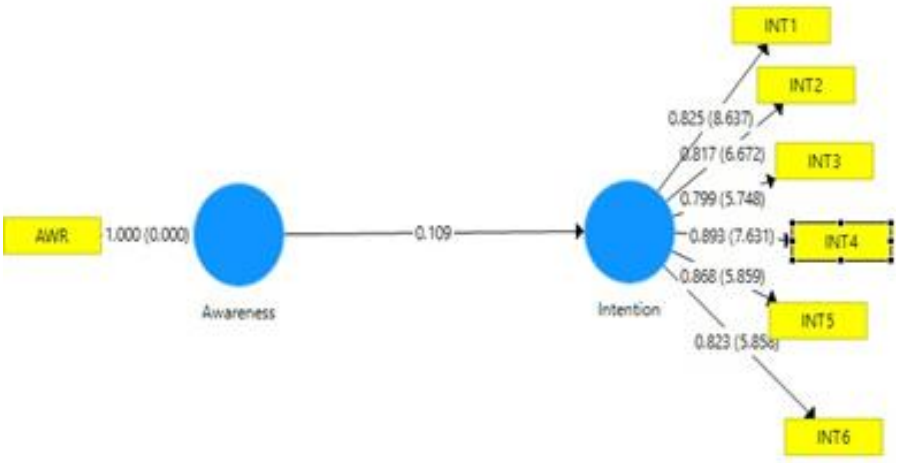

Figure 1. Research Structural Model

Reliability of Questionnaires. In order to measure validity and reliability, the author measures Cronbach's Alpha with an overall result > 0.6 and the AVE test with an overall result > 0.5 (Table 1). Cronbach's alpha is one of the methods for reliability tests. According to (Leguina, 2015), the minimum limit value for Cronbach's alpha is 0.6.

Table 1. Discriminant Validity

	Cronbach's Alpha	Average Variance Extracted (AVE)

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Awareness	1,000	1,000
Intention	0,917	0,702

Source: Data Processed 2023

Level of Construction Teams Sustainable construction awareness. In order to gain a level of sustainable construction awareness, respondents were given ten multiple-choice questions (Appendix A). The result is shown in Fig 3. The result shows that the highest awareness level is owned by the Site Administration Manager (SAM), Site Engineering Manager (SEM), and Office Engineer (OE).

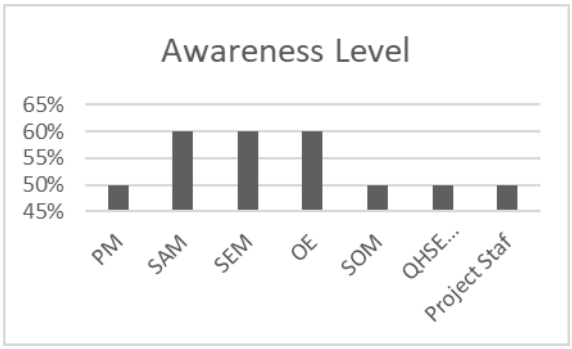

Figure 3. Awareness Level of Sustainable Construction

Intentions to Implement Sustainable Construction. To Assess respondents' intentions to implement SC, they were asked to rate their intentions from 1 to 5, as shown below (Fig 4). The result shows that the Site Operation Manager (SOM) has the highest intention.

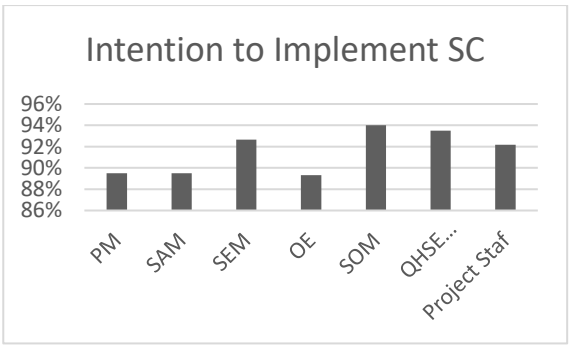

Figure 4. Intention to Implement Sustainable Construction

Potential Barrier to Implement Sustainable Construction. The author ran word analysis through NVIVO software (version 14.0) to get results regarding what barriers were most often conveyed by respondents when the author asked about the obstacles and challenges faced in implementing sustainable construction. From the word cloud (fig.4) and tree map (fig. 5), the author can say that the respondents' most significant barriers to implementing sustainable construction were material, competence, cost, and time. This is in line with (AlSanad, 2015) and (Serpell et al., 2013), whose research also found that economic barriers become one of the main barriers that need more Government attention to implement sustainable construction.

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Figure 5. Word Cloud Preview

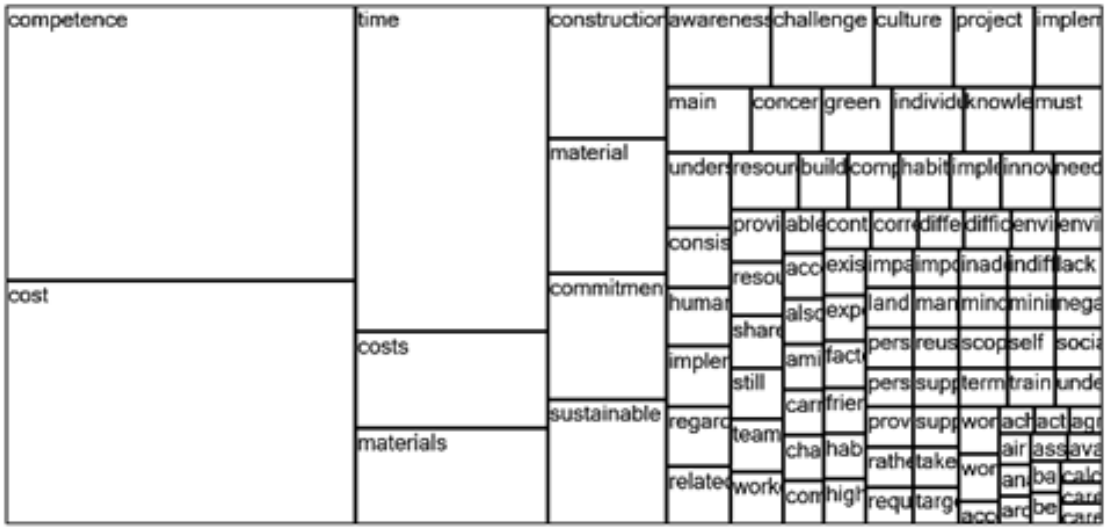

Figure 6. Tree Map Preview

Correlation between Level of Awareness and Intention to implement

Table 2. Hypothesis Result

Hypothesis	Path Coefficient	Standard Deviation (STDEV)	P Values	Result
H1 AWR-INT	0.142	0.088	**0.109**	**Insignificant**

Source: Data Processed 2023

In Order to measure whether the hypothesis is accepted from question number 3, the author states the hypothesis (Awareness has a significant effect on Intention to Implement), and the results show that awareness does not significantly affect the intention to implement related to sustainable construction. It can come to regression equation as below.

$Y=\beta+0.109X+€$

where

Y: Intention to Implement

X: Awareness

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β: Intercept
€: Error Factor

According to the hypothesis test results, there was no significant effect of the Level of Sustainable Construction Awareness on the Intention to Implement Sustainable Construction in Indonesian construction state companies. This contrasts the evaluation results obtained by the Kuwait building Industry, which demonstrated that the Level of Awareness is closely related to the intention to undertake sustainable construction. (AlSanad, 2015)

CONCLUSION

This study has presented data collected using a questionnaire and analysis of the results. The objectives of the questionnaire were to examine the level of the Construction Team's awareness of sustainable Construction (SC) in Indonesian State-owned construction in order to measure their level of knowledge in implementing sustainable construction, construction impacts on the environment, measure how the respondent's view of the potential barriers that may exist toward implementing the practice of sustainable construction. To achieve these objectives, the questionnaire was administered to experienced construction teams in the Indonesian construction industry; 266 completed questionnaires were used for this part of the research project.

The data from the questionnaires was then organized and analyzed using SmartPLS. The reliability of the data was checked using Cronbach's Alpha test. The results highlighted moderate general awareness levels towards Sustainable Construction concepts (6 of 10). More significant effort is required to raise awareness levels. In addition, the questionnaire results revealed that the majority of respondents have very high intention to implement sustainable construction; the main potential Barriers are Sustainable Construction cost, time, material, and competencies of construction teams, and the result of the hypothesist test showed that awareness does not have a significant effect to intention implement related with sustainable construction. To promote the Sustainable Construction concept, the Government could carry out more campaigns and immediately require the implementation of laws related to sustainable construction. This will then encourage all stakeholders involved to make changes in order for them to comply with the Sustainable Construction regulation.

REFERENCES

AlSanad, S. (2015). Awareness, Drivers, Actions, and Barriers of Sustainable Construction in Kuwait. *Procedia Engineering, pp. 118*, 969–983. https://doi.org/https://doi.org/10.1016/j.proeng.2015.08.538

CIB and UNEP-IETC (2002). Agenda 21 for Sustainable Construction in Developing Countries, CSIR Building and Construction Technology, Pretoria.

Ezema, I. C., Opoko, P. A., & Oluwatayo, A. A. (2016). De-carbonizing the Nigerian housing sector: The role of life cycle CO2 assessment. *International Journal of Applied Environmental Sciences, 11*(1), 325–349.

Gehlot, M., & Shrivastava, S. (2022). Sustainable construction Practices: A perspective view of Indian construction industry professionals. *Materials Today: Proceedings, 61*, 315–319. https://doi.org/https://doi.org/10.1016/j.matpr.2021.09.493

Isa, R. B., Jimoh, R., & Achuenu, E. (2013). An overview of the construction sector's contribution to sustainable development in Nigeria.

Ismail, F. Z., Halog, A., & Smith, C. (2017). How sustainable is disaster resilience? *International Journal of Disaster Resilience in the Built Environment, 8*(5), 555–572. https://doi.org/10.1108/IJDRBE-07-2016-0028

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Indexed By : GARUDA Google doi Crossref ROAD INDEX COPERNICUS Indonesia OneSearch ISJD sinta 4 EBSCO Clarivate Analytics

Jamil, A. H. A., & Fathi, M. S. (2016). The Integration of Lean Construction and Sustainable Construction: A Stakeholder Perspective in Analyzing Sustainable Lean Construction Strategies in Malaysia. *Procedia Computer Science, 100*, 634–643. https://doi.org/https://doi.org/10.1016/j.procs.2016.09.205

Khan Babar, A. H., & Ali, Y. (2022). Framework construction for augmentation of resilience in critical infrastructure: Developing countries a case in point. *Technology in Society, 68*, 101809. https://doi.org/https://doi.org/10.1016/j.techsoc.2021.101809

Leguina, A. (2015). A primer on partial least squares structural equation modeling (PLS-SEM). *International Journal of Research & Method in Education, 38*(2), 220–221. https://doi.org/10.1080/1743727x.2015.1005806

Maqbool, R., Namaghi, J. R., Rashid, Y., & Altuwaim, A. (2023). How modern construction methods would support meeting the sustainable construction 2025 targets still needs to be clarified. *Ain Shams Engineering Journal, 14*(4), 101943. https://doi.org/https://doi.org/10.1016/j.asej.2022.101943

Nasereddin, M., & Price, A. (2021). Addressing the capital cost barrier to sustainable construction. *Developments in the Built Environment, 7*, 100049. https://doi.org/https://doi.org/10.1016/j.dibe.2021.100049

Ofori, G. (2007). Construction in developing countries. *Construction Management and Economics, 25*(1), 1–6.

PUPR (2021). Pedoman Penyelenggaraan Konstruksi berkelanjutan.

Rock, S., Hosseini, M. R., Nikmehr, B., Martek, I., Abrishami, S., & Durdyev, S. (2019). Barriers to "green operation" of commercial office buildings: *Perspectives of Australian facilities managers. Facilities, 37*(13/14), 1048–1065.

Serik, T., Ferhat, K., Serdar, D., & Calay, R. K. (2020). Construction professionals' perspectives on drivers and barriers of sustainable construction. *Environment, Development and Sustainability, 22*(5), 4361–4378. https://doi.org/https://doi.org/10.1007/s10668-019-00388-3

Serpell, A., Kort, J., & Vera, S. (2013). Awareness, actions, drivers and barriers of sustainable construction in Chile. *Technological and Economic Development of Economy, 19*(2), 272–288. https://doi.org/10.3846/20294913.2013.798597

Sev, A. (2009). How can the construction industry contribute to sustainable development? A conceptual framework. *Sustainable Development, 17*(3), 161–173. https://doi.org/https://doi.org/10.1002/sd.373

Shashi, Centobelli, P., Cerchione, R., Ertz, M., & Oropallo, E. (2023). What we learn is what we earn from sustainable and circular construction. *Journal of Cleaner Production, 382*, 135183. https://doi.org/https://doi.org/10.1016/j.jclepro.2022.135183

Shurrab, J., Hussain, M., & Khan, M. (2019). Green and sustainable practices in the construction industry. *Engineering, Construction and Architectural Management, 26*(6), 1063–1086. https://doi.org/10.1108/ECAM-02-2018-0056

Son, H., Kim, C., Chong, W. K., & Chou, J. (2011). Implementing sustainable development in the construction industry: constructors' perspectives in the US and Korea. *Sustainable Development, 19*(5), 337–347.

Willar, D., Waney, E. V. Y., Pangemanan, D. D. G., & Mait, R. E. G. (2021). Sustainable construction practices in the execution of infrastructure projects: The extent of implementation. *Smart and Sustainable Built Environment, 10*(1), 106–124. https://doi.org/https://doi.org/10.1108/SASBE-07-2019-0086

WCED (1987). Our Common Future, Oxford University Press, Oxford.

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Zainul Abidin, N. (2010). Investigating the awareness and application of sustainable construction concept by Malaysian developers. *Habitat International, 34*(4), 421–426. https://doi.org/https://doi.org/10.1016/j.habitatint.2009.11.011