Challenges in Sustainability
https://www.acadlore.com/journals/CIS

The Influence of Climate Literacy and Awareness on the Utilisation of Climate-Related Information among Unskilled Construction Workers in Malaysia

Isyaku Hassan[1*], Mohd Nazri Latiff Azmi[1], Muhamad Fazil Ahmad[2], Qaribu Yahaya Nasidi[3], Ahmad Taufik Hidayah Abdullah[1]

[1] Faculty of Languages and Communication, Universiti Sultan Zainal Abidin, 21300 Terengganu, Malaysia
[2] Faculty of Applied Social Sciences, University Sultan Zainal Abidin, 21300 Terengganu, Malaysia
[3] Mass Communication Department, Ahmadu Bello University, 810107 Zaria, Nigeria

[*] Correspondence: Isyaku Hassan (isyakuhassan@unisza.edu.my)

Received: 02-16-2025 **Revised:** 03-28-2025 **Accepted:** 05-26-2025

Citation: Hassan, I., Azmi, M. N. L., Ahmad, M. F., Nasidi, Q. Y., & Abdullah, A. T. H. (2025). The Influence of climate literacy and awareness on the utilisation of climate-related information among unskilled construction workers in Malaysia. *Chall. Sustain.*, *13*(3), 354–365. https://doi.org/10.56578/cis130303.

Abstract: Substantial scientific consensus has confirmed that global warming, driven by climate change, poses significant risks to both environmental and occupational systems. In response, the Malaysian government has taken notable steps, including the enactment of the National Policy on Climate Change in 2009 and subsequent commitments to develop comprehensive legislation aimed at strengthening national climate strategies. Despite these institutional efforts, the dissemination and uptake of climate-related information remain hindered by misinformation campaigns and varying levels of public literacy. Among those most vulnerable are unskilled construction workers, who are increasingly exposed to occupational hazards, productivity disruptions, and worksite risks linked to extreme weather events. To evaluate how climate literacy and awareness influence the utilisation of climate-related information within this group, a cross-sectional study was conducted involving 144 randomly selected unskilled construction workers registered with the Construction Industry Development Board (CIDB) across the Malaysian states of Terengganu and Selangor. Data were collected using structured, self-administered questionnaires and analysed through structural equation modelling using analysis of moment Structures (SEM-AMOS). The results revealed that higher levels of climate literacy significantly enhanced the effective use of climate-related information, whereas general awareness of climate change did not demonstrate a statistically significant effect. This divergence indicates that while awareness may foster recognition of climate issues, it is the depth of literacy—defined as the ability to critically interpret, evaluate, and act upon climate information—that drives meaningful behavioural engagement. These findings underscore the necessity for policy frameworks and educational interventions to prioritise literacy-building rather than awareness campaigns alone. It is proposed that targeted capacity-building programmes, particularly within labour-intensive industries, be developed to equip vulnerable populations with the necessary tools for informed decision-making in climate-sensitive contexts. This study advances the academic discourse on climate communication and policy implementation by identifying literacy as a pivotal factor in climate information engagement among marginalised labour segments.

Keywords: Climate change literacy; Climate change awareness; Information usage; Unskilled construction workers; Occupational vulnerability; Malaysia; Structural equation modelling using analysis of moment structures (SEM-AMOS)

1. Introduction

Climate change represents a highly detrimental issue with long-term undesirable consequences globally (Lutzke et al., 2019; Pogson, 2021). For three decades, irresistible scientific evidence has revealed rising temperatures due to climate change, and thus, concern over its long-term effects on living creatures has grown (Vowles & Hultman, 2021). However, developing information literacy for climate change remains challenging (Strudwicke & Grant,

2020), perhaps due to consistent anti-climate campaigns and cognitive psychological processes. Information literacy, concisely, refers to a set of abilities that enables an individual to acquire, evaluate, and use information (Webber & Johnston, 2000). Nevertheless, Strudwicke & Grant (2020) pointed out that "climate activism is becoming increasingly common worldwide and is often emotionally charged, stemming from narratives of negative effects and fear for the future".

In Malaysia, there has been an increase in the prominence of climate change as an imperious policy issue with the government's firm support. The government enacted the National Policy on Climate Change in 2009. In 2021, the government announced under the 12th Malaysia Plan that legislation on climate change would be formulated to increase coordination and enhance the effectiveness of climate change campaigns. However, awareness about the hazards of climate change becomes challenging due to certain factors, such as anti-climate campaigns. As such, research indicates the need to advance people's knowledge, awareness, and information usage about climate change, as exposure to accurate climate-related information could influence their attitudes toward climate change (Azmi et al., 2015; Loy et al., 2020). This is because people tend to form their attitudes toward climate change based on their level of climate-related information (Cheng & Gonzalez-Ramirez, 2021).

Moreover, unskilled construction workers have been identified as one of the most affected groups facing increased occupational hazards, decreased productivity, and a greater likelihood of work disruptions resulting from the possible effects of climate change. For instance, studies highlight that unskilled construction workers in Malaysia often engage in critical tasks involving manual labor such as site clearing and basic construction activities, which are prone to reduced quality of workmanship due to inadequate training and safety practices (Akhtar et al., 2019; Choong et al., 2018). Choong et al. (2018) found that unskilled workers primarily focus on earning income rather than skill development, which can hinder their engagement with climate-related practices.

Additionally, Newman & Humphrys (2020) explored how climatic heat stress exacerbates construction workers' precariousness. The study highlights construction workers' vulnerability to workplace hazards intensified by climate change. For example, heat stress impacts workers' health as industries transition to low-carbon practices. This transition risks marginalizing workers unless proactive measures such as capacity building and technical assistance are implemented (Akhtar et al., 2019). These unsafe work behaviors among construction workers underscore the importance of workplace interventions to improve safety and adaptability in high-risk environments (Seo et al., 2025; Xia et al., 2023).

Despite the critical significance of climate-related information in shaping the climate debate, none of the previous studies have systematically analyzed this phenomenon, particularly among unskilled construction workers. In addition, research into unskilled workers' climate-related information literacy to mitigate the effects of climate change in Malaysia is either lacking or inadequate. Thus, the current study addresses this gap by providing an early quantification of how climate-related awareness and literacy influence the utilization of climate information among unskilled construction workers, a demographic often overlooked in climate change research. By exploring this relationship, the study contributes to a deeper understanding of the factors that enhance or hinder climate information usage in this critical yet vulnerable sector. The aim is to evaluate the influence of climate-related awareness and literacy on unskilled construction workers' engagement with climate information to suggest appropriate measures to help enhance climate change policy in Malaysia. Specifically, this study aims to achieve the following objectives.

1. To investigate the effect of climate change awareness on the usage of climate-related information among unskilled construction workers.
2. To examine the effect of climate change literacy on the usage of climate-related information among unskilled construction workers.

2. Literature Review

A report by the Lancet Commission shows that climate change has become "the major global health issue of the 21st century". The growing temperatures resulting from climate change are predicted to distress the lives of billions of people. By 2090, temperatures will be higher in several countries. As a global issue, climate change has many anticipated consequences. Accordingly, contemporary studies have revealed evidence for both long-term and mid-term possible effects of climate change on several facets of human health and the environment (Hassan et al., 2024; Knox-Hayes, 2022; Semenza & Paz, 2021). For example, Knox-Hayes (2022) revealed that the increase in ocean level per se "will create up to one billion climate change refugees by the year 2100". Nevertheless, while movements against the harmful risks of climate change are being made worldwide by health societies and activists, climate-related misinformation continues to disrupt such campaigns (King et al., 2022; Sancino et al., 2022).

In 2022, disinformation was mentioned by the Intergovernmental Panel on Climate Change (IPCC) as a significant barrier to climate change campaigns (King et al., 2022). Consequently, climate-related literacy must be taken seriously to help resolve the climate crisis. Recently, studies conducted in several countries have focused on climate-related information and literacy campaigns to suggest effective measures (e.g., Chen et al., 2022; Cheng & Gonzalez-Ramirez, 2021; Hoy et al., 2025; Ogunbode, 2024; Petersen et al., 2019; Raj & Amin, 2024; Taylor

& Johnston, 2020; Tuitjer & Dirksmeier, 2021; Wolff & Taddicken, 2022). The studies observed significant outcomes within emergent debates about climate change information and literacy. For instance, Raj & Amin (2024) utilized qualitative methods, including interviews and focus groups, to examine factors influencing climate literacy among different demographics. The study found that a well-informed public is more likely to engage in sustainable practices, suggesting that education systems should prioritize climate literacy to enhance societal resilience against climate change.

Moreover, Ogunbode (2024) utilized surveys and interviews to explore local perceptions of climate change in Nigeria. The study revealed that community awareness significantly influences adaptive strategies. These findings underscore the necessity of tailoring climate communication to resonate with local contexts, which could enhance the effectiveness of climate action initiatives. Likewise, Thapa & Dhakal (2024) employed quantitative methods to assess rice seed growers' perceptions and adaptation strategies regarding climate change in Nepal. The findings indicated a strong correlation between climate literacy and adaptive behaviors. The study reinforces the need for targeted educational interventions. In a broader context, Field et al. (2024) reflected on climate change educational outcomes and emphasized the significance of knowledge in fostering proactive environmental behaviors. Similarly, Hoy et al. (2025) assessed users' perceptions of climate tools and highlighted the importance of user-friendly resources for effective engagement.

In Malaysia, the issue of climate change poses substantial threats to many sectors, such as construction, national food security, and crop productivity (Junsheng et al., 2019). As such, there has been an upsurge in the prominence of climate change as an urgent policy issue, which has received the government's strong backing (Majid, 2021). In 2009, as reported by Majid, the Malaysian government enacted the National Policy on Climate Change. In 2021, additionally, the government reiterated its commitment under the 12th Malaysia Plan to formulate legislation on climate change to strengthen the efficiency of climate change awareness campaigns.

Very few studies have focused on climate change information and literacy in the Malaysian context. For instance, Akhtar et al. (2019) utilized interviews to explore rice farmers' perceptions and adaptation capacities to climate change. The study found that while farmers recognized climate change as a significant threat, their adaptive measures were often limited by a lack of access to information. Subsequently, Yaacob et al. (2022) employed surveys and focus group discussions to examine climate change perceptions among 350 participants in Peninsular Malaysia. The findings indicated a general awareness of climate change but highlighted gaps in understanding specific adaptation strategies. The literature on climate change information in Malaysia reveals significant insights into community awareness and adaptation strategies in the agricultural sector. None of the prior studies has paid attention to how climate-related awareness, literacy, and information usage can be developed among construction workers to suggest appropriate measures that can help improve climate change policy in the country, which the current study will address.

3. Hypothesis Development

3.1 Climate Change Awareness and Information Usage

A growing body of literature emphasizes the crucial role of awareness in shaping climate change information usage. For instance, Halady & Rao (2010) explored the relationship between climate awareness and information usage. The study concluded that rising awareness often leads to proactive measures in response to climate risks. Similarly, Abbasi & Nawaz (2020) found that increased climate change awareness significantly influenced information usage strategies among agricultural communities. Furthermore, Ghazy & Fathy (2023) demonstrated that structured awareness programs can effectively enhance knowledge and practices regarding climate change. These findings concur with a study conducted by Baiardi & Morana (2021), which provides empirical evidence from the European Union that awareness directly correlates with informed decision-making regarding climate issues. These studies indicate the potential for similar outcomes in the construction sector, where increased climate change awareness among unskilled construction workers may increase climate-related information usage and foster better adaptation practices in the face of environmental challenges. Therefore, the following hypothesis was formulated.

H_1: Climate change awareness has a significant positive effect on climate-related information usage among unskilled construction workers.

3.2 Climate Change Literacy and Information Usage

Previous research provides evidence for the transformative potential of climate literacy in enhancing climate-related information usage. For instance, Rahmawaty et al. (2024) conducted a scientometric analysis of climate literacy research. The study revealed that increased literacy correlates with improved understanding and application of climate-related knowledge across various sectors. Similarly, Anderson (2024) employed a mixed-methods approach to explore attitudes toward climate education. The study concluded that awareness fosters

information usage and proactive engagement with climate issues. In addition, Papagiannaki et al. (2024) assessed citizen climate literacy in the Eastern Mediterranean. The findings demonstrated that individuals with high literacy levels tend to use climate-related information and adopt environmentally responsive behaviors. Moreover, Yeh et al. (2024) highlighted the implications of climate change literacy among public officials in Taiwan and the need for strategic educational interventions to strengthen information usage and adaptive capacities. Recently, Hu et al. (2025) supported these outcomes by demonstrating that climate literacy can bridge the gap between pro-environmental intentions and actual behaviors, which suggests that increased climate literacy translates into information usage and positive actions. These studies indicate that similar outcomes could be obtained when analyzing the critical role of climate change literacy in enhancing climate-related information usage among unskilled construction workers. Therefore, the following hypothesis was formulated.

H_2: Climate change literacy has a significant positive effect on climate-related information usage among unskilled construction workers.

3.3 Proposed Model

The hypothesis testing is performed to determine relationships between climate awareness and literacy (independent variables) and climate-related information usage (dependent variable) as moderating variables. The following figure represents the proposed model for the current study.

The conceptual model explains the interrelationships between climate change awareness, literacy, and information usage among unskilled construction workers. As shown in Figure 1, the model posits that increased awareness of climate change issues enhances workers' climate-related information usage. The model suggests that increased awareness among construction workers could result in the effective use of relevant information. Additionally, the model hypothesizes that construction workers' increased climate literacy positively affects their climate-related information usage. This model underscores the importance of developing awareness and literacy as critical components for improving information usage among unskilled construction workers in Malaysia.

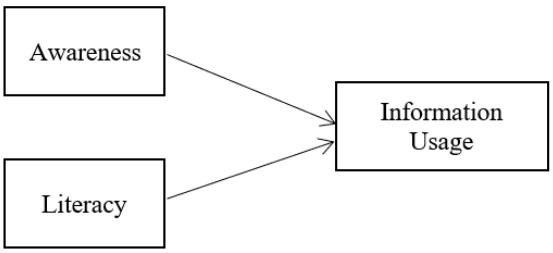

Figure 1. Conceptual model

4. Methodology

4.1 Design

The current research utilized a quantitative correlational design to systematically investigate the relationships among the study's variables and test the proposed hypotheses. This design enables a systematic examination of numerical data and statistical inference (Cohen et al., 2007; Creswell, 2012). The correlational design was specifically chosen to explore the nature and strength of associations among the variables. This approach is appropriate as the study uses a structured survey method and aims to investigate how the variables co-vary, which emphasizes using standardized instruments to ensure consistency and reliability in data collection. The structured survey facilitated the collection of quantifiable data suitable for statistical analysis. This design is consistent with quantitative correlational designs employed in previous research (Nasidi et al., 2024; Zaki et al., 2023) to ascertain meaningful insights into the relationships among variables.

4.2 Data Collection and Analysis

The data for this research were collected from unskilled construction workers in the states of Terengganu and Selangor. These states are chosen to represent other regions across Malaysia. As explained earlier, this group of workers is considered a crucial but often overlooked demographic in climate change awareness. According to the CIDB annual report for 2021, there were 413,760 registered unskilled workers. First, a sample of 144 unskilled construction workers was selected from the study area using the simple random sampling technique, which suggests that all unskilled construction workers registered with CIDB in the study area have an equal chance of being chosen for the current study. The simple random sampling technique has several advantages, including its

ability to collect data quickly and characterize a large population (Teddlie & Yu, 2007). This sample size was determined using Krejcie & Morgan (1970)'s formula for sample size calculation. Subsequently, data were gathered using a self-constructed questionnaire as the data-gathering tool. The questionnaire items are graded on a five-point Likert scale, with responses ranging from "strongly disagree" to "strongly agree". Subsequently, analysis was performed using the Partial Least Squares (PLS) software.

4.3 Validity and Reliability Test

The instrument's validity and reliability were determined using expert reviews and Cronbach's Alpha (Cronbach, 1951). First, the expert review was conducted to ensure content validity. A panel of experts evaluated the questionnaire items for sufficiency, clarity, coherence, and relevance to ensure that the instrument accurately measured the intended constructs (Ab Hamid et al., 2017). Feedback from the experts was incorporated to refine the questionnaire and enhance its alignment with the research objectives. Next, reliability testing was performed using Cronbach's Alpha to assess internal consistency among the items within each construct. A threshold of 0.7 or higher was set as the acceptable lower bound for reliability (Hair et al., 2014). These steps ensured that the instrument was both valid and reliable for capturing data (Nasidi et al., 2022) on climate-related awareness, literacy, and information usage among unskilled construction workers in Malaysia.

As shown in Table 1, all three constructs (climate change awareness, literacy, and information usage) have Cronbach's Alpha values above 0.9, reflecting excellent internal consistency and reliability. The values suggest that the items used for each construct reliably measure the underlying concepts with minimal error, making the data robust for further analysis.

Table 1. Reliability statistics for the constructs

No	Constructs	Items	Cronbach's Alpha	Decision
1	Climate Change Awareness	08	0.918	Achieved
2	Climate Change Literacy	10	0.917	Achieved
3	Information Usage	08	0.928	Achieved

4.3.1 Discriminant validity

The variables underwent a discriminant validity test, as shown in Table 2. First, the Average Variance Extracted (AVE) was calculated for each construct to measure the variance captured by indicators relative to measurement error (Ab Hamid et al., 2017). Next, the square root of the AVE for each construct was compared to its correlations with other constructs, following the Fornell & Larcker (1981)'s criterion. Discriminant validity was confirmed when the square root of the AVE for a construct exceeded its correlations with other constructs. For example, the square root of the AVE for Awareness (0.719) was higher than its correlation with Literacy (0.612) and Information Usage (0.442), which establishes discriminant validity for Awareness. Similarly, Literacy and Information Usage satisfied this criterion to demonstrate that all constructs were distinct and supported the model's validity in differentiating between these concepts.

Table 2. Discriminant validity

Constructs	Awareness	Literacy	Information Usage
Awareness	0.719		
Literacy	0.612	0.813	
Information Usage	0.442	0.636	0.713

4.3.2 Convergent validity

The convergent validity analysis in this study was conducted through Factor Loadings, Average Variance Extracted (AVE), and Composite Reliability (CR). First, factor loadings were examined to assess the strength of the relationship between individual items and their respective constructs. Items with low factor loadings were removed, such as AW1 and AW2 for the Awareness construct and IU6, IU8, and IU10 for Information Usage, to ensure that only items strongly related to their constructs were retained. For example, AW6 had a high factor loading of 0.894, while IU5 and LI5 demonstrated loadings of 0.878 and 0.950, respectively. Next, the AVE was calculated for each construct to measure the proportion of variance captured by indicators versus measurement error. All constructs met the AVE threshold of 0.5, with Awareness at 0.517, Literacy at 0.661, and Information Usage at 0.508, indicating acceptable convergent validity (Ab Hamid et al., 2017). Finally, Composite Reliability (CR) was inferred based on the AVE values and high factor loadings, suggesting that CR exceeded the threshold value of 0.6 for all constructs (Fornell & Larcker, 1981). These steps confirmed that the retained items measured their intended constructs and established adequate convergent validity for the study.

As depicted in Table 3, the validity for awareness, after deleting items AW1 and AW2, item AW6 had a factor

loading of 0.894 and an AVE of 0.517, indicating acceptable convergent validity. Similarly, for the Literacy construct, item LI5 had a factor loading of 0.950 and an AVE of 0.661, confirming convergent validity. For the Information Usage construct, after deleting items IU6, IU8, and IU10, item IU5 had a factor loading of 0.878 and an AVE of 0.508, which met the acceptable threshold. Each construct exhibits acceptable convergent validity based on the specified criteria.

Table 3. Convergent validity analysis

Construct	Item Label	Factor Loadings	Ave (Above 0.5)	CR (Above 0.6)
Awareness	Deleted		0.894	0.517
	Deleted			
	AW3			
	AW4			
	AW5			
	AW6			
	AW7			
	AW8			
	AW9			
	AW10			
Literacy	LI1		0.950	0.661
	LI2			
	LI3			
	LI4			
	LI5			
	LI6			
	LI7			
	LI8			
	LI9			
	LI10			
Information Usage	IU1		0.878	0.508
	IU2			
	IU3			
	IU4			
	IU5			
	Deleted			
	IU7			
	Deleted			
	IU9			
	Deleted			

5. Findings

The current research models the effect of climate change awareness and literacy on climate-related information usage among unskilled construction workers. The following sections explain the conceptual model that underpins this research, with details about the connections among the study variables as illustrated in the accompanying figures.

5.1 Structural Model

Figure 2 shows the study's research hypotheses for direct effects, which were evaluated using the structural model's standardized estimates and regression weights. These standardized path coefficients represent the strength of the relationships between the exogenous (independent) constructs, Awareness and Literacy, and the endogenous (dependent) construct, Information Usage. The path coefficients provide insights into the direct effects of these independent variables on the dependent variable. For example, the path coefficient from Awareness to Information Usage is 0.09, indicating a small but positive direct effect. In contrast, Literacy to Information Usage shows a much stronger relationship, with a path coefficient of 0.58. This outcome suggests that Literacy has a more substantial influence on Information Usage than Awareness does.

In the model, the single-headed arrows represent these causal relationships, showing the direct effects of the exogenous variables on the endogenous variable. The results from these arrows were used to test the research hypotheses concerning the direct effects. Additionally, a double-headed arrow between Awareness and Literacy indicates the correlational relationship between these two constructs. The correlation coefficient of 0.61 suggests that Awareness and Literacy are moderately positively related, meaning that one variable tends to increase when the other increases. Still, this relationship is correlational rather than causal.

Moreover, the squared multiple correlation (R^2) value for the Information Usage construct is 0.41, meaning that 41% of the variance in Information Usage is explained by Awareness and Literacy combined. This value highlights the model's relatively strong explanatory power, particularly with the key role of Literacy in predicting Information Usage. Overall, the regression results confirm that the exogenous constructs significantly impact the endogenous construct, with Literacy having a more pronounced effect, while the correlational effects between Awareness and Literacy provide additional context for understanding their relationship.

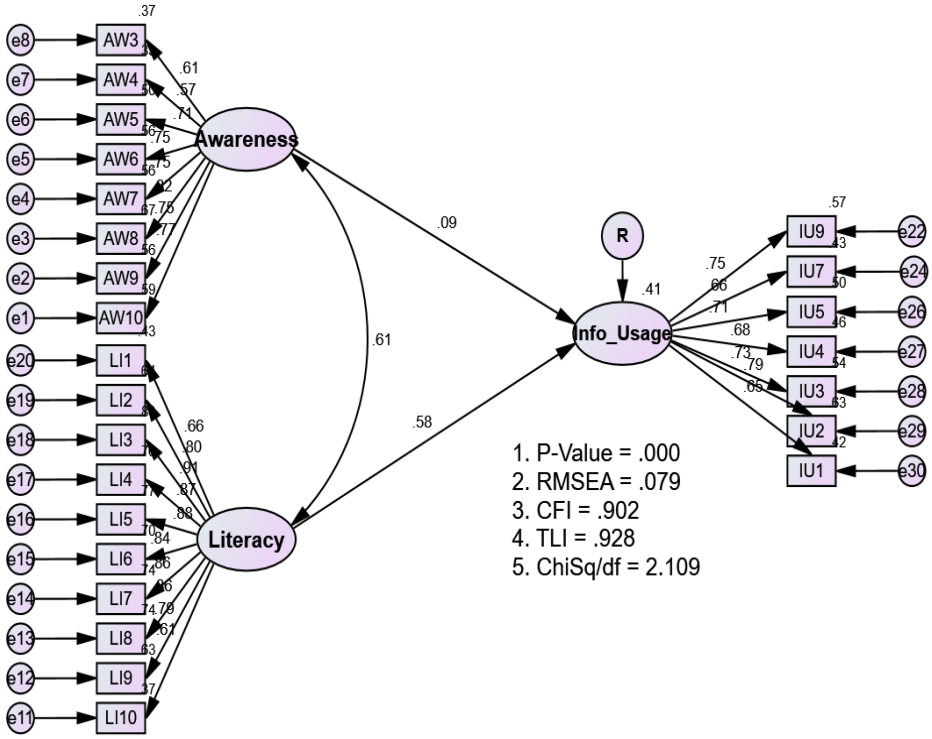

Figure 2. Standardised structural model

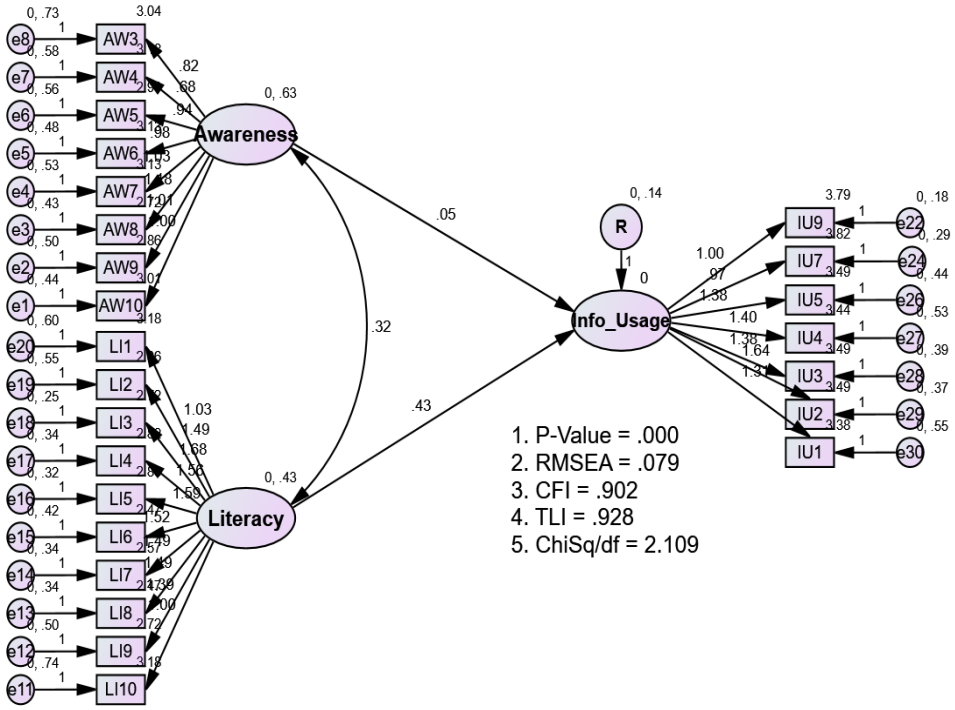

Figure 3. Unstandardised structural model

Figure 3 displays the unstandardized estimates of the regression path coefficients. The figure represents the relationships between the exogenous constructs (Awareness and Literacy) and the endogenous construct (Information Usage). The path from Awareness to Information Usage has a regression coefficient of 0.05, indicating that for every one-unit increase in Awareness, Information Usage is expected to increase by 0.05. While this relationship is statistically significant, the effect size is relatively small, suggesting that Awareness has a modest impact on Information Usage. On the other hand, the path from Literacy to Information Usage has a higher regression coefficient of 0.43, meaning that a one-unit increase in Literacy results in a 0.43-unit increase in Information Usage. This outcome indicates that the Literacy variable has a much more substantial effect on Information Usage than Awareness. Additionally, the double-headed arrow between Awareness and Literacy shows a correlation coefficient of 0.32, reflecting the moderate relationship between these two variables. These unstandardized estimates highlight that while Awareness and Literacy significantly impact Information Usage, Literacy plays a more dominant role.

5.2 Hypothesis Testing

Table 4 presents the results of the hypothesis testing for the current study. The table shows the regression weights from the path analysis for each exogenous construct's influence on the endogenous construct. These regression weights are extracted from Figure 3.

Table 4. Regression weights

Relationship			Estimate	S.E.	C.R.	P	Value
Info_Usage	<---	Awareness	0.052	0.061	0.858	Info_Usage	<---
Info_Usage	<---	Literacy	0.430	0.091	4.722	Info_Usage	<---

The first path represents the influence of Awareness on Information Usage, which has a regression coefficient (estimate) of 0.052, a standard error (S.E.) of 0.061, a critical ratio (C.R., also known as z-value) of 0.858, and a p-value of 0.391. Since the p-value is greater than 0.05, the effect of Awareness on Information Usage is statistically insignificant. This result indicates that Awareness does not significantly influence Information Usage. The outcome suggests that simply being aware of information does not translate into its utilization.

In contrast, the path from Literacy to Information Usage shows a regression coefficient of 0.430, a standard error of 0.091, and a critical ratio of 4.722, with a p-value less than 0.05. This outcome indicates that Literacy has a positive and statistically significant direct effect on Information Usage. These results support the hypothesis that Literacy significantly influences Information Usage, while Awareness does not. Thus, the findings strongly support the hypothesis that Literacy significantly influences Information Usage. The result indicates that individuals with higher literacy levels are more likely to utilize information effectively.

6. Discussion

The findings from this research highlight the critical role of climate change awareness and literacy in shaping information usage among unskilled construction workers in Malaysia. The findings indicate that while awareness of climate change issues is present, its impact on information usage is unsubstantial, as evidenced by a low path coefficient of 0.05. This outcome aligns with previous studies that highlight the role of awareness in using climate-related information (Abbasi & Nawaz, 2020; Ghazy & Fathy, 2023; Halady & Rao, 2010). This outcome may be attributed to the unique characteristics of the study population, where awareness alone may not be sufficient to drive information usage without the necessary literacy skills to understand and apply the information effectively. Or perhaps the existing awareness campaigns are not tailored to unskilled construction workers' specific needs and knowledge levels.

In the Malaysian context, where climate change poses significant threats to various sectors, it is essential to recognize that mere awareness may not be sufficient to drive effective information usage. As highlighted by Yaacob et al. (2022), gaps in understanding specific measures can hinder proactive responses. Therefore, the current study underscores the need for targeted educational interventions beyond raising awareness to include practical applications of climate knowledge. This intervention has important implications for designing effective climate change education and communication strategies, particularly for vulnerable populations such as unskilled construction workers.

Furthermore, the findings reveal a substantial positive effect of climate change literacy on information usage, with a regression coefficient of 0.43. This outcome corroborates previous research indicating that higher literacy levels are associated with more effective utilization of climate-related information (Anderson, 2024; Hu et al., 2025; Rahmawaty et al., 2024; Papagiannaki et al., 2024; Yeh et al., 2024). For instance, Rahmawaty et al. (2024) found that increased literacy correlates with improved understanding and application of climate-related knowledge. The current study reinforces these findings by demonstrating that climate literacy enables workers to effectively

utilize climate-related information, which can lead to better adaptation practices.

In Malaysia, where studies on climate literacy among construction workers are scarce, the current research fills a critical gap by demonstrating that enhancing literacy can lead to better engagement with climate information. The implications are significant; the more construction workers become literate about climate issues, the more likely they are to adopt more sustainable practices and contribute to national efforts in combating climate change. This outcome is particularly relevant given the Malaysian government's commitment to addressing climate change through policies and legislation to improve public understanding and responsiveness (Majid, 2021).

Moreover, the moderate correlation between awareness and literacy (0.32) suggests an interplay between these constructs that warrants further exploration. While awareness can serve as a precursor to literacy, it is evident that additional support mechanisms are necessary to translate awareness into actionable knowledge. This outcome aligns with the findings of Ogunbode (2024), which emphasize tailoring climate communication to local contexts for enhanced effectiveness. In Malaysia's diverse socio-economic landscape, developing educational programs that resonate with unskilled construction workers' unique experiences and challenges is crucial. By fostering a deeper understanding of climate issues within their specific work environment, these programs can empower workers to utilize information more effectively.

In essence, the current research highlights the critical importance of both climate change awareness and literacy in enhancing information usage among unskilled construction workers in Malaysia. While awareness alone may not suffice to drive significant behavioral changes, increasing literacy levels can substantially improve engagement with climate-related information. These findings call for strategic educational interventions that promote practical applications of knowledge in the construction sector. As Malaysia continues to grapple with the impacts of climate change, fostering a well-informed workforce will be essential for developing effective adaptation strategies and ensuring sustainable practices within the industry.

7. Conclusion

This study modeled the effect of climate awareness and literacy on the use of climate-related information among unskilled construction workers in Malaysia. According to the findings, climate change literacy significantly influences the use of climate-related information among unskilled construction workers. Conversely, climate change awareness does not significantly affect the use of climate-related information. This outcome suggests that workers with higher literacy levels are more likely to utilize climate change information, perhaps because they possess the necessary skills to process and apply information effectively. The findings indicate that, beyond mere awareness, literacy is essential in utilizing climate-related information among unskilled construction workers. The study has important implications for policy and practice. First, policymakers should prioritize literacy development over awareness through targeted educational programs to promote climate-related information usage among unskilled construction workers in Malaysia. The focus should shift from increasing awareness to equipping workers with the literacy skills needed to interpret and act on climate change information. Additionally, climate communication strategies should be tailored to meet the specific literacy levels of unskilled construction workers.

The current findings are envisaged to provide valuable information regarding climate-related information in the construction sector to suggest appropriate measures that can help enhance climate change policies. This contribution is also expected to broaden public understanding of climate change. Understanding construction workers' climate-related information awareness, literacy, and usage can supplement targeted awareness programs. The research also provides an early quantification of empirical evidence that could help to develop a more creative approach to mitigating the long-term effects of climate change among construction workers. However, while the current study modeled awareness and literacy levels at a specific time, changes in these constructs or their long-term impact on information usage have not been examined. Future research could employ longitudinal analyses to assess the long-term effects of workers' climate awareness and literacy on their information usage. The current study is also limited to establishing direct correlations between climate change awareness, literacy, and information usage. Future research should explore the mediating factors influencing how these variables affect information usage, such as motivation, access to resources, or social influences within the workplace.

Funding

This work is funded by the Center for Research Excellence and Incubation Management (CREIM), Universiti Sultan Zainal Abidin (UniSZA) (Grant No.: RD034, UniSZA/2023/DPU 1.0/23).

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

References

Ab Hamid, M. R., Sami, W., & Sidek, M. H. M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. *J. Phys. Conf. Ser.*, *890*(1), 012163. https://doi.org/10.1088/1742-6596/890/1/012163.

Abbasi, Z. A. K. & Nawaz, A. (2020). Impact of climate change awareness on climate change adaptations and climate change adaptation issues. *Pak. J. Agric. Res.*, *33*(3), 619.

Akhtar, R., Masud, M. M., & Afroz, R. (2019). Perception of climate change and the adaptation strategies and capacities of the rice farmers in Kedah, Malaysia. *Environ. Urbanization ASIA*, *10*(1), 99–115. https://doi.org/10.1177/0975425318822338.

Anderson, A. (2024). Climate change and sustainability literacy: A mixed-methods study of attitudes to climate education in secondary schools. *Clim. Change*, *177*, 169. https://doi.org/10.1007/s10584-024-03815-1.

Azmi, N. J., Omar, N. A. M., Zaid, S. B. M., Wahab, Z., & Yusof, A. (2015). Media portrayal on global climate change: An analysis of Malaysian mainstream newspapers. *Stud. Media Commun.*, *3*(1), 73–78. https://doi.org/10.11114/smc.v3i1.815.

Baiardi, D. & Morana, C. (2021). Climate change awareness: Empirical evidence for the European Union. *Energy Econ.*, *96*, 105163. https://doi.org/10.1016/j.eneco.2021.105163.

Chen, K., Molder, A. L., Duan, Z., Boulianne, S., Eckart, C., Mallari, P., & Yang, D. (2022). How climate movement actors and news media frame climate change and strike: Evidence from analyzing Twitter and news media discourse from 2018 to 2021. *Int. J. Press Politics*, *28*(2), 384–413. https://doi.org/10.1177/19401612221106405.

Cheng, H. & Gonzalez-Ramirez, J. (2021). Trust and the media: Perceptions of climate change news sources among US college students. *Postdigital Sci. Educ.*, *3*(3), 910–933. https://doi.org/10.1007/s42438-020-00163-y.

Choong, W. F., Hashim, M. A. S., & Toudehdehghan, A. (2018). Foreign workers' reduction in Malaysian construction industry. *Inti J. Bulit Environ.*, *2*(8), 1–15.

Cohen, L., Manion, L. & Morrison, K. (2007). *Research Method in Education*. New York: Routledge.

Creswell, J. W. (2012). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches (2nd ed.)*. London: Sage Publications.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334.

Field, E., Berger, P., Lee, D., Strutt, C., & Nguyen, A. T. (2024). Knowledge, urgency and agency: Reflections on climate change education course outcomes. *Environ. Educ. Res.*, *30*(11), 2108–2130. https://doi.org/10.1080/13504622.2023.2296359.

Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *J. Market. Res.*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104.

Ghazy, H. K. & Fathy, D. M. (2023). Effect of awareness program regarding climate change on knowledge, attitudes, and practices of university students. *Int. Egyptian J. Nursing Sci. Res.*, *3*(2), 186–203. https://doi.org/10.21608/ejnsr.2023.277896.

Hair, J. F., Gabriel, M., & Patel, V. (2014). AMOS covariance-based structural equation modeling (CB-SEM): Guidelines on its application as a marketing research tool. *Braz. J. Market.*, *13*(2), 28–37. https://doi.org/10.5585/remark.v13i2.2718.

Halady, I. R. & Rao, P. H. (2010). Does awareness of climate change lead to behavioral change? *Int. J. Clim. Change Strategies Manag.*, *2*(1), 6–22. https://doi.org/10.1108/17568691011020229.

Hassan, I., Musa, R. M., Abdullah, M. R., Latiff Azmi, M. N., & Abdullah, A. T. H. (2024). Evaluation of climate change coverage across news sources in selected Malaysian electronic newspapers. *Inf. Dev.*, https://doi.org/10.1177/02666669241284992.

Hoy, A., Swartling, Å. G., Ustrnul, Z., Wypych, A., Nevmerzhytska, A. V., & Leander, E. (2025). Too much, yet not enough? Assessing climate tool users' perceptions, needs and access constraints. *Reg. Environ. Change*, *25*(1), 1–16. https://doi.org/10.1007/s10113-024-02338-w.

Hu, C., Pan, W., Wen, L., & Pan, W. (2025). Can climate literacy decrease the gap between pro-environmental intention and behaviour? *J. Environ. Manage.*, *373*, 123929. https://doi.org/10.1016/j.jenvman.2024.123929.

Junsheng, H., Akhtar, R., Masud, M. M., Rana, M. S., & Banna, H. (2019). The role of mass media in communicating climate science: An empirical evidence. *J. Cleaner Prod.*, *238*, 117934. https://doi.org/10.1016/j.jclepro.2019.117934.

King, J., Janulewicz, L., & Arcostanzo, F. (2022). *Deny, deceive, delay: Documenting and responding to climate disinformation at COP26 and beyond*. Policy Commons. https://policycommons.net/artifacts/2470903/summative-report-cop26/3492909/

Knox-Hayes, J. (2022). Combating climate change: Dismantling the spatial and temporal assumptions of the core and periphery. *Geog. Res.*, *60*(2), 342–346. https://doi.org/10.1111/1745-5871.12537.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educ. Psychol. Meas.*,

30(3), 607–610. https://doi.org/10.1177/001316447003000308.
Loy, L. S., Hamann, K. R., & Reese, G. (2020). Navigating through the jungle of information. Informational self-efficacy predicts climate change-related media exposure, knowledge, and behavior. *Clim. Change*, *163*(4), 2097–2116. https://doi.org/10.1007/s10584-020-02918-9.
Lutzke, L., Drummond, C., Slovic, P., & Árvai, J. (2019). Priming critical thinking: Simple interventions limit the influence of fake news about climate change on Facebook. *Global Environ. Change*, *58*(1), 1–8. https://doi.org/10.1016/j.gloenvcha.2019.101964.
Majid, A. A. (2021). *Malaysia's Climate Change Act? What to Expect*. Conventus Law. https://conventuslaw.com/report/malaysias-climate-change-act-what-to-expect/
Nasidi, Q. Y., Ahmad, M. F., & Dahiru, J. M. (2022). Exploring items for measuring social media construct: An exploratory factor analysis. *J. Intell. Commun.*, *2*(1), 366–374. https://doi.org/10.54963/jic.v2i1.53.
Nasidi, Q. Y., Norde, A. B., Dahiru, J. M., & Hassan, I. (2024). Tiktok usage, social comparison, and self-esteem among the youth: Moderating role of gender. *Galactica Media J. Media Stud.*, *6*(2), 121–137. https://doi.org/10.46539/gmd.v6i2.467.
Newman, F. & Humphrys, E. (2020). Construction workers in a climate precarious world. *Crit. Soc.*, *46*(4–5), 557–572. https://doi.org/10.1177/0896920519880951.
Ogunbode, T. O. (2024). The climate change scenario in Nigeria: Local perceptions and the way forward. *Sustain. Agri Food Environ. Res.*, *12*(2), 442–453. https://doi.org/10.7770/safer-V13N1-art532.
Papagiannaki, K., Kotroni, V., & Lagouvardos, K. (2024). Assessing the effects of citizen climate literacy and attitudes on their 'greening' behaviour in a climate change hotspot region of the eastern Mediterranean. *Climate*, *12*(9), 146–154. https://doi.org/10.3390/cli12090146.
Petersen, A. M., Vincent, E. M., & Westerling, A. L. (2019). Discrepancy in scientific authority and media visibility of climate change scientists and contrarians. *Nat. Commun.*, *10*(1), 1–14. https://doi.org/10.1038/s41467-019-09959-4.
Pogson, M. (2021). Climate disinformation adverts: Real-world indicators of an online problem. *Acad. Lett.*, *3*(1), 1–10. https://doi.org//10.20935/AL512.
Rahmawaty, Ismail, M. H., Rauf, A., Abdullah, M. F., Mohd Noor, M. I., Amir Mustafa, A. M. A., Gandaseca, S., Karuniasa, M., et al. (2024). Understanding climate literacy research using scientometrics analysis. *Heliyon*, *10*(20), e39214. https://doi.org/10.1016/j.heliyon.2024.e39214.
Raj, P. S. & Amin, S. S. (2024). Climate literacy in the age of global climate change: A critical inquiry into shaping climate-literate society for a sustainable future. *Asian J. Interdisciplin. Res.*, *7*(2), 1–11. https://doi.org/10.54392/ajir2421.
Sancino, A., Stafford, M., Braga, A., & Budd, L. (2022). What can city leaders do for climate change? Insights from the C40 cities climate leadership group network. *Reg. Stud.*, *56*(7), 1224–1233. https://doi.org/10.1080/00343404.2021.2005244.
Semenza, J. C. & Paz, S. (2021). Climate change and infectious disease in Europe: Impact, projection and adaptation. *Lancet Reg. Health Eur.*, *9*(1), 1–10. https://doi.org/10.1016/j.lanepe.2021.100230.
Seo, H. J., Rhee, S. Y., & Yoon, Y. G. (2025). Enhancing worker safety behaviors through the job demands-resources approach: Insights from the Korean construction sector. *Buildings*, *15*(3), 486. https://doi.org/10.3390/buildings15030486.
Strudwicke, I. J. & Grant, W. J. (2020). #JunkScience: Investigating pseudoscience disinformation in the Russian Internet Research Agency tweets. *Publ. Understanding Sci.*, *29*(5), 459–472. https://doi.org/10.1177/0963662520935071.
Taylor, S. & Johnston, G. (2020). *ENSC 162: Real news, fake news: Media's influence on the public's opinion of climate change*. Digital Commons. https://digitalcommons.longwood.edu/spring_showcase/2020/honorscollege/24/
Teddlie, C. & Yu, F. (2007). Mixed methods sampling: A typology with examples. *J. Mixed Methods Res.*, *1*(1), 77–100. https://doi.org/10.1177/1558689806292430.
Thapa, R. & Dhakal, S. C. (2024). Climate change perception and adaptation strategies of rice seed growers in Chitwan district, Nepal. *Farming Syst.*, *2*(3), 100095. https://doi.org/10.1016/j.farsys.2024.100095.
Tuitjer, L. & Dirksmeier, P. (2021). Social media and perceived climate change efficacy: A European comparison. *Digital Geogr. Soc.*, *2*(1), 1–10. https://doi.org/10.1016/j.diggeo.2021.100018.
Tyagi, A. (2021). *Challenges in Climate Change Communication on Social Media*. Pittsburgh: Carnegie Mellon University Press.
Vowles, K. & Hultman, M. (2021). Scare-quoting climate: The rapid rise of climate denial in the Swedish far-right media ecosystem. *Nordic J. Media Stud.*, *3*(1), 79–95. https://doi.org/10.2478/njms-2021-0005.
Webber, S. & Johnston, B. (2000). Conceptions of information literacy: New perspectives and implications. *J. Inf. Sci.*, *26*(6), 381–397. https://doi.org/10.1177/016555150002600602.
Wolff, L. & Taddicken, M. (2022). Disinforming the unbiased: How online users experience and cope with dissonance after climate change disinformation exposure. *New Media Soc.*, *26*(5), 2699–2720.

https://doi.org/10.1177/14614448221090194.
Xia, N., Griffin, M. A., Xie, Q., & Hu, X. (2023). Antecedents of workplace safety behavior: Meta-analysis in the construction industry. *J. Constr. Eng. Manage.*, *149*(4), 23–39. https://doi.org/10.1061/jcemd4.coeng-12492.
Yaacob, M., So, W. W. M., & Iizuka, N. (2022). Exploring community perceptions of climate change issues in Peninsular Malaysia. *Sustainability*, *14*(13), 7756. https://doi.org/10.3390/su14137756.
Yeh, S. C., Chen, Y. H., Van Velzen, R., & Lin, P. H. (2024). The climate change literacy of public officials in Taiwan: Implications and strategies for global adaptation. *Policy Stud.*, *46*(2), 168–201. https://doi.org/10.1080/01442872.2024.2304086.
Zaki, T. S. A. B. T., Abdullah, N. H., Ahmad, M. F., & Hassan, I. (2023). Community-based corporate social responsibility: A series of confirmatory factor analyses. *Int. J. Prof. Bus. Rev.*, *8*(4), 32–43. https://doi.org/10.26668/businessreview/2023.v8i4.1537.