# Determinants of Energy Conservation Behaviour among University Staff: An Application of the Theory of Planned Behaviour

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## ABSTRACT

Energy consumption in university environments has become a concern due to increasing operational demands and the environmental impacts associated with excessive energy consumption. Promoting energy conservation behaviour within universities is essential for improving energy conservation in line with SDG 7 and SDG 13. Guided by the Theory of Planned Behaviour (TPB), data were collected from a sample of 251 academic staff. The results indicate attitude (ATT) is not significant, while subjective norms (SN) and perceived behaviour control (PBC) show a significant effect on intention energy conservation. The findings indicate that intention toward energy conservation is significantly affected by SN and PBC, highlighting the importance of normative norms and institutional support in promoting sustainable intention energy conservation in the university. The study contributes to a better understanding of the psychological and behavioural determinants of energy conservation among academic staff, thereby supporting the formulation of targeted behavioural intervention programmes, institutional policies, and awareness initiatives.

**Keywords:** Energy conservation behaviour, sustainable development goal (SDG), university, theory of planned behaviour, occupant behaviour

## INTRODUCTION

Energy represents a critical component of modern infrastructure supporting economic growth and societal development. Despite rapid global progress, energy consumption has been identified as a primary driver of ecological challenges, including climate change and pollution. Recent climate assessments highlight intensifying extreme weather events, rising global temperatures, and accelerated glacier melt, all of which threaten biodiversity, disrupt ecosystems, and impair agricultural productivity (Rawat et al., 2024). These changes also pose significant risks to human health, encompassing psychological, emotional, and social consequences, as well as heightened vulnerability to infectious diseases.

Across the commercial sector, university buildings are major energy users, accounting for a significant share of energy consumption. University operations remain a major source of carbon dioxide ($CO_2$) emissions, driven by the presence of various large-scale facilities and infrastructure that support academic and administrative activities. Universities are often described as “small cities” because of their extensive physical infrastructure and diverse populations. The operational activities, including laboratories, lecture halls, libraries, residential students, and administrative offices, each with distinct energy requirements (Katun & Popoola, 2025). This diversity of energy use accounts for approximately 30–40% of global final energy consumption and remains a major contributor to energy-related carbon emissions, responsible for nearly one-third of total greenhouse gas (GHG) emissions (Cibinskiene et al., 2020; Nations, 2025). These results emphasise the critical importance of energy efficiency and carbon reduction initiatives in fostering sustainable university environments.

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From this perspective, academic staff plays a crucial role within the socio-technical system that impacts a building's energy consumption. This behaviour refers to how occupants respond to discomfort and interact with the building system, which is related to energy consumption, including temperature conditions and indoor air quality (HVAC operation, window/door control, lighting system) (Yan et al., 2017). This motivation leads occupants to engage in actions such as adjusting room temperature, regulating sound levels, and managing lighting, all aimed at creating conditions that support their health and comfort preferences. A recent study emphasises that occupant interaction with HVAC systems, lighting, and ventilation controls contributes significantly to excessive and inefficient energy consumption in commercial and institutional buildings (Zhang et al., 2025). Subsequently, uncontrolled electricity use will ultimately lead to energy waste and negatively impact the balance of the global ecosystem. In line, some studies find academic staff often working in flexible, autonomous work settings, making behavioural compliance and energy-saving consistency more challenging to manage. Although technological advancements such as energy-efficient HVAC systems, automated controls, and smart building technologies contribute to improved energy performance, occupant behaviour also influences the determinants of actual building energy consumption (Chaer et al., 2025). Therefore, understanding the individual behaviour is important, as it, in turn, encourages sustainability actions.

## THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

The Theory of Planned Behaviour (TPB) is broadly acknowledged as a psychological model that provides a strong basis for interpreting and forecasting human behaviour across a wide range of social and environmental contexts. As shown figure 1, this TPB theory is shaped by three principal constructs: attitude toward the behaviour (ATT), subjective norms (SN), and perceived behavioural control (PBC). ATT reflects an individual's evaluative stance toward performing the behaviour, SN capture the influence of perceived social expectations, and PBC denotes the individual's perceived capability and autonomy in carrying out the behaviour.

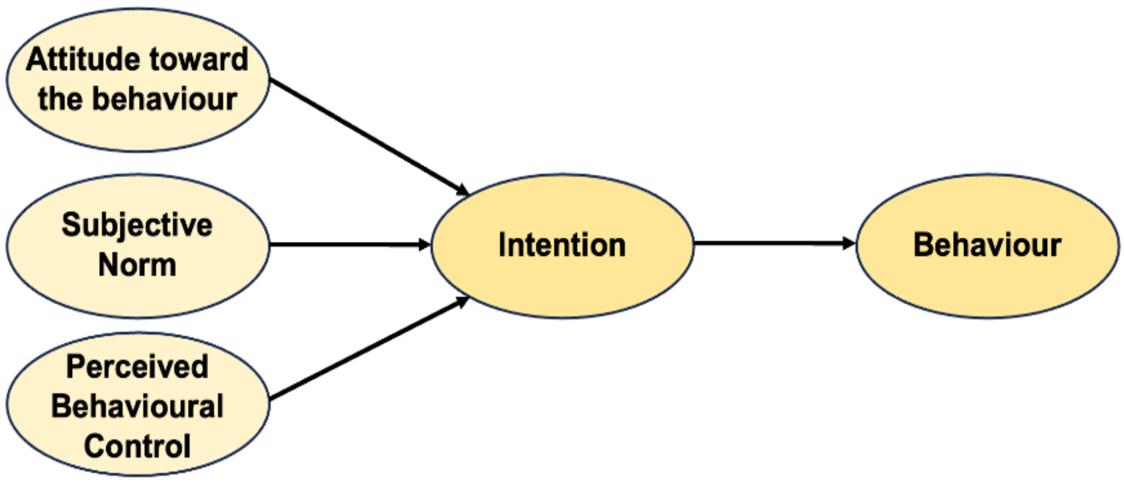


**Figure 1: The Theory of Planned Behaviour (Ajzen, 1991)**

The theory TPB has been extensively applied to explain and predict intention energy conservation across various environmental and organisational contexts. Prior research has consistently demonstrated that the TPB theory offers a robust framework for examining energy conservation and pro-environmental behaviour (Hnin et al., 2025). Similarly, empirical evidence continues to affirm the applicability of TPB in explaining pro-environmental and energy-related behaviours within organisational contexts (Puiu et al., 2025). This shows that ATT, SN and PBC are important constructs in predicting intention energy conservation. In summary, this study hypotheses the following:

H1: There is a significant influence of attitude towards intention energy conservation.

H2: There is a significant influence of Subjective norms towards intention energy conservation.

H3: There is a significant influence of perceived behavioural control towards intention energy conservation.

# METHODOLOGY

This study aims to examine the intention of energy conservation within Malaysian public universities. Data collection was conducted among university employees from January 2025 to August 2025, with participants selected through purposive sampling targeting academic staff. To ensure the reliability and validity of the measurement instrument, the questionnaire items were adapted from prior studies, and each was evaluated using a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Content validity was further strengthened through expert evaluation, whereby three academics reviewed the instrument and provided feedback. Revisions were subsequently incorporated to refine clarity and relevance. The collected data were analysed using SPSS version 25.0. Prior to hypothesis testing, preliminary data screening was conducted to assess normality and determine the dataset's suitability for factor analysis. The Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's Test of Sphericity were applied to assess the suitability of the dataset for subsequent factor analysis. In addition, the statistical significance of the path estimates was evaluated to determine whether the proposed hypotheses were empirically supported.

# RESULT AND DISCUSSION

The findings show that skewness and kurtosis values across constructs were within acceptable thresholds, supporting the assumption of normality. Specifically, skewness between –2 and +2 is acceptable, with kurtosis values above +2 indicating excessive peakedness and values below –2 suggesting flatness (Hair et al., 2021). The results presented in Table 1 indicate that the sample data meet these criteria, supporting the assumption of normality for subsequent multivariate analyses.

Table1. Kurtosis and Skewness Results

| Construct | Mean | Standard deviation | Skewness | S. E | Kurtosis | S. E | Normal distribution |
|---|---|---|---|---|---|---|---|
| ATT | 4.637 | 0.406 | -0.857 | 0.154 | -0.204 | 0.306 | Yes |
| SN | 3.955 | 0.686 | -0.472 | 0.154 | 0.080 | 0.306 | Yes |
| PBC | 4.171 | 0.452 | -0.119 | 0.154 | 0.074 | 0.306 | Yes |

Moreover, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were conducted to evaluate the suitability of the dataset for factor analysis. The KMO statistic assesses the proportion of common variance among variables and determines whether the intercorrelations are adequate for factor analytical procedures, while Bartlett's Test of Sphericity examines whether the correlation matrix significantly differs from an identity matrix. Consistent with the guidelines proposed by (Hair et al., 2019), a KMO values exceeding 0.50 indicate acceptable sampling adequacy, whereas a statistically significant Bartlett's test supports the factorability of the dataset. The results revealed that all constructs exceeded the recommended threshold values, indicating satisfactory sampling adequacy, with KMO values of 0.788 for ATT, 0.854 for SN, and 0.736 for PBC. In addition, Bartlett's Test of Sphericity yielded statistically significant results across all constructs ($p < 0.001$), confirming that the dataset was suitable for subsequent factor analysis. Table 2 presents the KMO values together with Bartlett's test outcomes for each construct observed in this study.

Table 2: Kaiser-Mayor-Olkin (KMO) and Bartlett test

| Construct | KMO value | Sampling adequacy (KMO>0.6) | Bartlett tests significant value | Factor analysis (p-value<0.05) |
|---|---|---|---|---|
| ATT | 0.788 | Acceptable | 0.000 | Acceptable |
| SN | 0.854 | Acceptable | 0.000 | Acceptable |
| PBC | 0.736 | Acceptable | 0.000 | Acceptable |

Furthermore, the structural model evaluation focused on the hypothesised relationships between latent constructs, assessed through path coefficients (β). Utilising Partial Least Squares Structural Equation Modelling (PLS-SEM), these coefficients were estimated to determine the strength and orientation of the paths defined in the research framework (Shafaay et al., 2025). Three direct hypotheses were tested, each representing a structural relationship between the latent constructs. The results offer insight into the validity of the proposed theoretical model. The bootstrapping analysis in PLS-SEM indicates that the path coefficient from an ATT toward intention to energy conservation is not statistically significant ($\beta = 0.104$, $p = 0.064$). In contrast, SN exert a significant positive influence on intention energy conservation ($\beta = 0.191$, $p = 0.001$). Similarly, PBC demonstrates a significant effect on intention energy conservation ($\beta = 0.248$, $p < 0.001$). These findings suggest that while ATT does not play a decisive role, both SN and PBC are critical determinants of intention energy conservation. Table 3 presents the hypothesis testing for the Direct Path Coefficient.

Table 3: Hypothesis Testing for Direct Path Coefficient

| Hypothesis | Path | Estimate (Beta) | S.E | T-Value | P-Value | Result |
|---|---|---|---|---|---|---|
| H1 | ATT→ IEC | 0.104 | 0.056 | 1.851 | 0.064 | Not Supported |
| H2 | SN→ IEC | 0.191 | 0.056 | 3.431 | 0.001 | Supported |
| H3 | PBC→ IEC | 0.255 | 0.072 | 3.558 | 0.000 | Supported |

# CONCLUSION

The findings collectively indicate that ATT toward intention energy conservation is not statistically significant ($\beta = 0.104$, $p = 0.064$), thus H1 is not significant. In contrast, SN exerts a significant positive influence on intention energy conservation ($\beta = 0.191$, $p = 0.001$). Similarly, PBC significantly affects intention to conserve energy ($\beta = 0.255$, $p < 0.000$), thus H2 and H3 are supported. Although respondents generally expressed favourable attitudes toward intention energy conservation, ATT alone does not appear sufficient to translate into behavioural intention within university contexts. For this study, energy conservation is more strongly shaped by organisational norms, social expectations, and perceived operational control than by individual evaluations. In addition, the significant effect of SN highlights the importance of social influence, peer expectations, and institutional culture in fostering energy conservation among academic staff. Likewise, the strong role of PBC suggests that individuals are more likely to engage in energy conservation behaviours when they perceive adequate capability, opportunity, and autonomy to act. Therefore, future research should incorporate additional contextual factors to obtain a more comprehensive understanding of the factors influencing attitude formation toward intention energy conservation within university environments.

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