Internalizing ESG: Validating Psychological Drivers as Leading Non-Financial Indicators (NFIs) in University Sustainability

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ABSTRACT

This study addresses a critical accountability gap in contemporary sustainability reporting by empirically examining the internal psychological factors that can serve as reliable leading Non-Financial Indicators (NFIs) for predicting Pro-Environmental Behaviour (PEB). Currently, institutional sustainability practices suffer from an over-reliance on lagging, retrospective output indicators that inherently fail to provide the predictive, timely, and actionable insights crucial for effective institutional governance and proactive policy intervention. Therefore, this research empirically validates whether internal psychological elements, categorised as normative, value-based, and cognitive drivers, can serve as reliable leading NFIs for PEB among students in Higher Learning Institutions (HLIs) in Malaysia. A quantitative, cross-sectional survey was conducted, collecting data from 338 university students using stratified sampling. The analysis employed Partial Least Squares Structural Equation Modelling (PLS-SEM), and the results revealed a critical dual challenge for behavioural governance. Personal Norms emerged as the most significant positive driver of PEB, confirming that intrinsic moral commitment is the primary control mechanism. Conversely, Social Norms exhibited a significant negative influence, indicating that PEB is currently perceived as a cultural barrier or outlier behaviour subject to peer disapproval. Other measured drivers, including General Values, Attitude toward PEB, and Environmental Awareness, were found to be statistically weak or insignificant predictors. This research provides a crucial methodological contribution by substantiating these internal psychological elements as measurable, forward-looking NFIs. The findings recommend a strategic shift for HLIs, prioritising high-impact Moral Reinforcement interventions to strengthen Personal Norms over traditionally ineffective, awareness-based campaigns. The study's core proposition is the formal inclusion of validated NFIs into governance dashboards, thereby enhancing the credibility and predictive capability of sustainability and ESG performance reporting. Furthermore, this study offers valuable insights for policymakers seeking to operationalise behavioural indicators within broader environmental governance systems.

Keywords: Non-Financial Indicators, Pro-Environmental Behaviour, ESG Reporting, Internal Psychological Drivers, Sustainability Reporting

INTRODUCTION

1.1 Background of the Study: The Imperative for Behavioural ESG Metrics

The escalating global risks of climate change, resource depletion, and environmental pollution have intensified the commitment to Sustainable Development (SD) worldwide. In this context, corporate accountability is increasingly guided by Environmental, Social, and Governance (ESG) frameworks, requiring comprehensive disclosure beyond traditional financial statements. For organisations such as HLIs,

demonstrating ESG integrity is essential, not only because of their significant operational impact but also due to their central role in developing future societal leaders (Steg & Vlek, 2009).

Central to an HLI's environmental and social performance is the collective PEB of its stakeholders, particularly its students. PEB, which includes daily activities such as efficient resource use (air conditioning, lighting), waste management, and responsible consumption, serves as a crucial mechanism for achieving operational efficiency and reducing environmental externalities. The consistent adoption of PEB functions as a pervasive internal control system, translating institutional policy intent into tangible environmental outcomes. Therefore, HLIs are uniquely positioned to measure, influence, and report on these behaviours as part of their comprehensive sustainability strategy. The challenge lies in developing metrics that effectively capture the behavioural inputs that precede and predict material environmental performance.

1.2 Problem Statement: The Accountability Gap in Sustainability Reporting

Current sustainability accounting and ESG reporting frameworks suffer from a critical accountability gap, rooted in a pervasive over-reliance on lagging output indicators (e.g., aggregate carbon emissions, water usage) (Papaspyropoulos & Karamanolis, 2016; Sun, 2025). While these retrospective metrics are necessary for compliance and historical disclosure, they inherently fail to provide the timely, predictive, and actionable insights required for effective organizational governance, policy effectiveness, or robust external assurance.

This systemic shortfall highlights an urgent need to identify and validate leading NFIs that focus specifically on human capital inputs. In the context of HLIs, this is profoundly critical, as students represent the future generation of leaders and professionals whose sustained behaviour is essential for achieving broader societal sustainable development goals. Consequently, for HLIs to secure genuine sustainability and enhance their ESG credibility, they are strongly recommended to successfully influence and change student behaviour (i.e. PEB). However, institutional efforts are frequently undermined by a persistent Knowledge-Action Gap, where students demonstrate high environmental awareness yet fail to consistently translate this awareness into PEB (Colombo et al., 2023; Parker & Prabawa-Sear, 2020).

This ongoing gap suggests that reliance on simple awareness campaigns is inefficient. To effectively bridge this gap and internalise ESG values, psychological drivers are to be acknowledged and validated as strong leading indicators that influence sustained PEB. This study addresses this theoretical and practical gap by empirically examining the influence of these internal psychological drivers, thereby integrating these factors as leading NFIs within a quantifiable framework for HLI governance and robust ESG assurance.

1.3 Research Objectives

The main objective of this research is to empirically investigate the internal psychological factors influencing PEB and to translate the significant findings into a quantifiable framework for developing behavioural NFIs.

The specific objectives of the study are:

1. To empirically examine the predictive influence of core internal psychological drivers (personal norms, general values, social norms, attitude towards PEB, and environmental awareness) on students' daily PEB.

2. To develop practical, data-driven recommendations and NFI strategies for HLIs to enhance student PEB, thereby strengthening their sustainability governance and ESG assurance.

1.4 Research Questions

Aligned to generate actionable NFIs, the study seeks to answer the following research questions:

1. How do core internal psychological drivers (personal norms, general values, social norms, attitudes towards PEB, and environmental awareness) significantly influence the daily PEB of students in HLIs?

2. What evidence-based practical strategies and behavioural NFIs can HLIs implement to effectively foster PEB, thereby contributing to robust sustainability accounting and ESG governance?

1.5 Significance of the Study

This research paper makes three distinct and significant contributions to the fields of Sustainability Accounting, ESG Governance, and Environmental Psychology:

1. Methodological Contribution to NFI Development: This study provides the empirical validation of psychological constructs as quantifiable, leading NFIs for the environmental pillar of ESG. By establishing the predictive strength of internal drivers on behaviour, it provides a statistical basis for incorporating an "Attitude Score" or "Personal Norm Index" directly into institutional leading NFIs, thereby improving the quality and measurability of human capital performance disclosure.

2. Enhancing Governance and Assurance: The findings provide HLI governance structures with a data-driven model to identify the most impactful leverage points for resource allocation. Rather than investing blindly in generic campaigns, institutions can target interventions that strengthen specific, high-impact psychological drivers (e.g., Personal Norms), ensuring greater assurance of the efficacy of their internal controls for sustainability.

3. Contextual Insight and Policy Relevance: By focusing on the unique HLI context in Selangor, Malaysia, the research provides culturally and institutionally relevant insights. These findings directly support local and national sustainability agendas (Ganapathy, 2016) and offer a blueprint for other universities participating in global rankings (e.g., UI Green Metric) by providing measurable human capital metrics.

1.6 Scope and Limitation of the Study

The geographical and demographic scope of this study is confined to undergraduate students enrolled at Universiti Selangor (UNISEL), Bestari Jaya campus. The core constructs examined are the five internal psychological variables (Personal Norms, General Values, Social Norms, Attitude toward PEB, and Environmental Awareness), all influencing seven specific daily environmental practices. This publication focuses on establishing the predictive validity of these internal drivers for NFI development. Although the research employs rigorous quantitative analysis (PLS-SEM) on a large, stratified sample, caution is advised when generalising results to institutions with markedly different cultural or infrastructural contexts. Nevertheless, the NFI approach based on internal drivers is expected to have broad methodological applicability.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 The Nexus of Behaviour, Accountability, and Sustainability Reporting (SR)

The current shift in corporate reporting from financial performance to holistic ESG disclosure has increased the demand for reliable non-financial data (Eccles et al., 2014). For an organisation to claim genuine sustainability performance, its reporting should go beyond mere compliance (such as reporting energy consumption) to demonstrate the underlying organisational controls and human capital inputs that enable or hinder sustainable practices. This includes HLIs, which, given their role in shaping societal norms, are under increasing pressure to demonstrate the effectiveness of their sustainability policies (Sewak et al., 2021).

A major challenge in sustainability accounting is the assurance deficit surrounding non-financial metrics. Unlike financial data, which is governed by strict rules, non-financial data, particularly those related to the "Social" and "Environmental" pillars, often lack consistent measurement protocols. There is an over-reliance on lagging indicators (e.g., waste generated) and a lack of leading indicators that predict future performance and provide timely feedback for management intervention. This study proposes that the internal

psychological state of students, as key agents of institutional environmental impact, can be quantified and used as robust, leading NFIs, thereby directly addressing the assurance deficit by mapping inputs to expected outputs. Studies in similar institutional settings have also measured behavioural aspects in relation to sustainable outcomes (Blok et al., 2015).

Psychological constructs such as attitudes, subjective norms, and perceived behavioural control are significant predictors of PEB. The Theory of Planned Behaviour (TPB) has been extensively used to explain these relationships. Studies on environmental conservation behaviour show that individuals with positive environmental attitudes and beliefs are more likely to intend and choose to protect the environment. Research consistently highlights attitude as a key factor shaping PEB, with evidence showing that it significantly influences conservation actions both at home and in the workplace (Akhir et al., 2022).

Psychological constructs are critical in understanding and promoting PEB due to their direct influence on individual motivations, attitudes, and social norms. While structural and operational factors are important, they often do not address the underlying psychological drivers that motivate individuals to engage in sustainable practices. Therefore, focusing on psychological constructs can lead to more effective and targeted interventions for promoting PEB (Akhir et al., 2022; Ebrahimi et al., 2024).

2.2 Theoretical Lens: Behavioural Antecedents as Intrinsic Management Control Systems

To situate internal psychological drivers within the sustainability accounting framework, this study adopts the perspective of Management Control Systems (MCS). MCS theory states that controls are mechanisms designed to increase the likelihood of achieving organisational goals (Malmi & Brown, 2008). In the context of environmental performance, institutional policies (such as mandates to recycle or rules against excessive printing) serve as formal or diagnostic controls. However, for these controls to be effective in daily discretionary activities such as PEB, they should be supported by strong intrinsic controls held by the individual. Intrinsic control refers to the internal mechanisms and motivations that govern an individual's behaviour and decision-making processes. This concept encompasses various aspects, including intrinsic motivation, cognitive control, and self-regulation. Intrinsic motivation is a dominant factor in encouraging PEB. Studies show that individuals with higher intrinsic motivation are more likely to engage in behaviours that benefit the environment, such as recycling, conserving resources, and supporting environmental policies (Sharpe et al., 2021; Silvi & Padilla, 2021). Intrinsic control leads to more lasting PEB because it builds long-term commitment (Kácha & Ruggeri, 2019), strengthens self-efficacy (Hua & Mi, 2025), and enhances personal agency (Chiang et al., 2019).

Behavioural models, such as the Theory of Planned Behaviour (TPB) (Ajzen, 1991) and the Value-Belief-Norm (VBN) Theory (Stern et al., 1999), provide the theoretical foundation for these intrinsic controls. These theories explain that an individual's decision to perform a behaviour is driven not only by rational knowledge, but also by deep-seated personal values, moral obligations (norms), and perceived social pressure. The application of these models is relevant even in specific local contexts to understand sustainability intentions (Empidi & Emang, 2021). By positioning the five internal variables (Values, Norms, Attitude, Awareness) as intrinsic feed-forward control mechanisms, this research paper aims to provide a diagnostic tool. For example, a high measured 'Personal Norm' score serves as a leading NFI, indicating a high probability of compliance with formal environmental policies and allowing governance to proactively assess and adjust resource allocation for behavioural interventions.

2.3 Deep Antecedents: General Values and Personal Norms

General values refer to abstract, desirable goals that guide an individual’s life and environmental actions. The VBN theory highlights that biospheric values (caring for nature) and altruistic values (caring for others) are fundamental determinants that activate environmental concern, serving as the deep-seated, stable foundation for PEB (Stern et al., 1999). In an HLI context, strong biospheric values among students serve as an important NFI of human capital quality, particularly in shaping ESG behaviour, indicating an innate predisposition towards the institution's environmental goals.

Personal norms, or moral obligations, refer to an individual's sense of moral responsibility to perform a specific action (Schwartz, 1992). Personal norms are often considered the most powerful psychological predictor, as they connect general values to concrete behaviour by internalising a moral cost for non-compliance. In accounting terms, a strong personal norm represents a highly effective internalised control mechanism, whereby the individual enforces the policy themselves. This study hypothesises that personal norms will be the most significant predictor, reflecting the depth of individual commitment to institutional sustainability targets.

2.4 Proximal Predictors: Social Norms and Attitude toward Pro-Environmental Behaviour

While values and personal norms are deep antecedents, social norms and attitudes towards PEB serve as more immediate, proximal drivers of PEB, which are often easier for management to influence through communication and feedback.

Social norms refer to the perceived standards of behaviour within a specific social group. Descriptive norms (what others do) and injunctive norms (what others approve of) are crucial in the collective environment of a university campus (Cialdini, 2003). Descriptive norms often outperform injunctive norms in encouraging behaviours like donations to environmental causes (Hamann et al., 2015; Ren et al., 2025). When these behaviours are visible, their influence through social norms becomes even stronger (Vesely & Klockner, 2018). University campuses serve as effective environments for promoting PEB due to the concentration of individuals and the potential for social influence. Interventions on campuses often use social norms to encourage behaviours like energy conservation, waste management, and sustainable consumption.

In ESG reporting, collective adherence to PEB is often measured through campus-wide resource usage. This study aims to demonstrate that the perceived social norm itself can be measured as a leading NFI. A high measured social norm score indicates successful institutional cultural control, suggesting that management has effectively leveraged peer pressure to minimise environmentally detrimental behaviours such as waste or excessive energy use.

Attitude toward PEB is defined as an individual's favourable or unfavourable evaluation of performing a specific pro-environmental action (Ajzen, 1991). A positive attitude reduces the perceived 'cost' of engaging in PEB and increases the likelihood of action. Institutional interventions, such as successful waste separation programmes and clear communication on energy savings, are intended to enhance this attitude. Therefore, a high measured 'Attitude Score' serves as an NFI, validating the effectiveness of management’s communication and programme design.

2.5 Environmental Awareness and the Knowledge-Action Gap

Environmental awareness refers to an individual's knowledge of environmental issues, consequences, and solutions. Historically, it was assumed that greater knowledge directly leads to greater action. However, extensive literature highlights the Knowledge-Action Gap, showing that high environmental awareness often does not translate into consistent PEB (Colombo et al., 2023). This gap poses a significant risk for governance, as investment in awareness campaigns yields poor behavioural returns (Parker & Prabawa-Sear, 2020).

This study re-examines the role of awareness as a precursor to more influential drivers such as personal norms and attitude, rather than as a direct predictor of behaviour. Its inclusion is crucial for NFI development, as it enables HLIs to measure the initial informational input (awareness score) against the actual behavioural output (PEB score), thereby auditing the efficiency of their knowledge dissemination efforts.

Moreover, contemporary research emphasises that environmental awareness does not operate in isolation; rather, it interacts dynamically with other psychological constructs that ultimately shape behaviour. Awareness can strengthen personal norms, influence attitudes, and enhance perceived behavioural control, thereby indirectly contributing to PEB. For example, individuals with high awareness may still fail to act unless they also experience moral obligation, strong attitudes, or supportive social norms (Bamberg & Möser,

2007). In this sense, awareness functions as an enabling condition that amplifies the effects of other determinants, suggesting that its influence on behaviour is contingent upon its integration with broader motivational and social factors.

2.6 Pro-Environmental Behaviour

Pro-environmental behaviour (PEB) is commonly defined as deliberate actions undertaken to protect the environment and support sustainability outcomes (Tian & Liu, 2022). These behaviours function as non-financial indicators of individuals' environmental responsibility, reflected through practices such as conserving energy, recycling, minimising waste, and making responsible consumption choices. Because of its relevance to understanding how people contribute to environmental well-being, PEB continues to attract strong interest across various academic fields, particularly in efforts to address global environmental challenges.

General values serve as a deep motivational foundation for PEB. These values shape how individuals interpret environmental issues and determine whether they view environmental protection as a moral priority. Within the Value-Belief-Norm framework, such values activate environmental beliefs that strengthen personal norms, which are internalised moral obligations to act responsibly toward the environment (Nkaizirwa et al., 2022; Hidalgo-Crespo et al., 2023; Ly, 2024; Prasetyo et al., 2024). Personal norms have been consistently shown to exert a direct influence on PEB, functioning as a strong psychological driver even when external incentives are weak. Thus, general values initiate the motivational process, while personal norms translate these values into concrete environmental actions.

Social norms also play a critical role by shaping behaviour through social expectations and perceived approval from others. These normative pressures can directly influence pro-environmental intentions and are often internalised into personal norms that further strengthen behaviour (Cedrún-Vázquez et al., 2025; Kim & Seock, 2019; Ly, 2024). In parallel, attitudes toward environmental actions, whether an individual views them positively or negatively, can predict behavioural intentions, although attitudes often exert a weaker influence compared to normative and control factors. Within frameworks such as the Theory of Planned Behaviour, attitudes work alongside subjective norms to shape an individual's willingness to engage in PEB. Together, social norms provide external motivational cues while attitudes reflect internal evaluations, both contributing to variations in pro-environmental actions.

Environmental awareness adds another important layer by shaping how individuals understand environmental problems, their consequences, and possible solutions. Awareness does not simply precede behaviour; rather, it interacts with norms and attitudes by heightening perceived responsibility and reinforcing the belief that individual actions matter (Ly, 2024). Higher awareness is associated with stronger behavioural intentions and can moderate the relationship between moral norms and behaviour by providing the cognitive basis for informed action. Although awareness alone may not close the knowledge-action gap, it enhances the effect of other psychological drivers, making individuals more likely to translate their environmental concerns and moral obligations into consistent PEB.

2.7 Synthesis and Hypotheses Development

Based on the established theoretical framework of behavioural models and their reinterpretation as intrinsic management control systems, this research hypothesises that the five core internal psychological drivers are significant predictors of PEB. The statistical validation of these relationships provides the empirical basis required to translate these constructs into reliable accountability metrics for ESG reporting.

The following hypotheses will be tested:

H_1: Personal Norms positively and significantly influence students' PEB.

H_2: General Values positively and significantly influence students' PEB.

H_3: Social Norms positively and significantly influence students' PEB.

H_4: Attitude toward PEB positively and significantly influences students' PEB.

H_5: Environmental Awareness positively and significantly influences students' PEB.

THE RESEARCH METHODOLOGY

3.1 Introduction: Linking Behavioural Metrics to ESG Accountability

This section outlines the research design and systematic procedures used to investigate the relationship between students' psychological drivers and PEB within an HLI context. The methodological approach aims not only to validate the psychological model but also to provide the empirical foundation for translating these intangible drivers into verifiable NFIs for institutional ESG reporting. This chapter presents the research design, sampling strategy, instrumentation, and the PLS-SEM analysis used for model testing. The study focuses on the Universiti Selangor (UNISEL) Bestari Jaya campus as its specific context.

3.2 The Research Design and Approach

This study employs a quantitative survey design to examine the relationships and predictive patterns between constructs on PEB in the context of HLIs. This approach is suitable for capturing behavioural tendencies at a single point in time and evaluating the associations between the constructs. In line with the study's objective to validate internal psychological constructs as key leading NFIs for ESG accountability, this approach enables the systematic measurement of intangible behavioural drivers that cannot be directly observed but are crucial to sustainable governance.

The PLS-SEM technique was used as the analytical method because of its prediction-oriented approach and suitability for theory-building research. PLS-SEM is recognised as a robust method for analysing complex models with multiple latent constructs, especially when data do not meet the assumption of normality (Hair et al., 2021). Most importantly, the use of PLS-SEM aligns with this study's objective of identifying significant behavioural predictors that can be translated into behavioural accountability metrics as the main NFIs in ESG reporting by HLIs. This method, therefore, supports both the theoretical contribution and the practical application of ESG-NFI in this study.

3.2.1 Target Population and Sampling

This study was conducted at Universiti Selangor (UNISEL), Bestari Jaya campus, Malaysia. The campus was chosen because it offers a suitable ecosystem for examining PEB, as students represent a key population influencing daily resource consumption patterns such as energy use, waste generation, and water consumption. The target population comprised all full-time students residing or studying at the UNISEL Bestari Jaya campus during the data collection period. A stratified random sampling method was used to ensure balanced representation across study levels (Foundation, Diploma, and Bachelor's Degree) and academic faculties. This sampling approach enhanced the generalisability of the study results and reflected the diversity of behaviours within the student population. Based on Cochran's formula, with a confidence level of 95% and a sampling error of 5%, the recommended minimum sample size was 353. The study achieved 338 valid responses, amounting to 96% of the required sample. The sample remains acceptable for PLS-SEM, provided that the model is not overly complex (Hair et al., 2021). Data collection took place between October and November 2024 using self-administered questionnaires. Before the main study, a pilot study involving 32 students was conducted to ensure the clarity and reliability of the instrument, and minor revisions were made based on the feedback received. A summary of the respondents' demographic profile is presented in Table 1.

Table 1. Demographic Profile of Respondents

Variables	Items	Frequency	Percent
Age	17 - 21 years old	273	81
	22 to 26 years old	64	19
	Total	337	100
Gender	Male	112	33.2
	Female	225	66.8
	Total	337	100
Race	Malay	237	70.3
	Indian	86	25.5
	Chinese	2	0.6
	Others	12	3.6
	Total	337	100
Faculty	PUSAT PENGAJIAN ASASI DAN UMUM (PADU)	46	13.6
	FAKULTI PENDIDIKAN DAN SAINS SOSIAL (FPSS)	194	57.6
	FAKULTI KOMUNIKASI, SENI VISUAL & PENGKOMPUTERAN (FKSVP)	85	25.2
	FAKULTI KEJURUTERAAN DAN SAINS HAYAT (FKSH)	10	3
	FAKULTI PERNIAGAAN DAN PERAKAUNAN (FPP)	2	0.6
	Total	337	100
Study Level	Foundation	46	13.6
	Diploma	196	58.2
	Bachelor Degree	95	28.2
	Total	337	100
Accommodation	Hostel Resident	295	87.5
	Non-Resident	42	12.5
	Total	337	100

3.2.2 Pro-Environmental Behaviour (PEB)

The dependent variable, PEB, focuses on specific daily actions undertaken by students that directly impact the HLI's environmental performance. The seven areas of behaviour measured are as depicted in Table 2.

Table 2. Measurement of Pro-Environmental Behaviour

Behavioural Domain	Description of Behaviour Items	Resources
Energy Conservation	Practices related to reducing energy use on campus, such as responsible use of air-conditioning, fans, and lighting.	Zhang et al. (2021); Zacher & Bissing-Olson (2018)
Printing and Paper Usage	Behaviours focused on minimising paper consumption, such as limiting printing, using double-sided printing, and opting for digital documents.	Barr (2007)
Single-Use Plastic Reduction	Actions aimed at reducing plastic consumption, such as bringing reusable bottles or reducing the purchase of bottled drinks.	Prakash & Pathak (2017)
Sustainable Consumption Habits	Environmentally responsible purchasing decisions, including buying eco-friendly products and avoiding unnecessary consumption.	Joshi & Rahman (2015); Testa et al. (2020)
Digital Device Energy Management	Responsible usage of electronic devices to reduce energy, such as turning off devices when not in use and enabling power-saving settings.	Siero et al. (1989); Yu et al. (2022)
Waste Separation and Recycling	Engagement in recycling, waste sorting, and proper disposal of recyclable materials on campus.	Wan et al. (2017); Kollmuss & Agyeman (2002)
Water Usage Habits	Practices related to conserving water, including turning off taps properly and avoiding water wastage.	Dolnicar et al. (2012); Fielding et al. (2012)

3.2.3 Measures (Internal Factor Focus)

The internal constructs influencing PEB were measured using established scales adapted from previous research. All measurement items for these constructs were rated using a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5), as summarized in Table 3.

Table 3. Measurement of Internal Constructs Influencing Pro-Environmental Behaviour

Internal Factors		
Constructs	**Definition**	**Key Sources**
Personal Norms	Internal moral obligation to act in environmentally responsible ways.	Stern et al. (1999); Van der Werff et al. (2013); Helferich et al. (2023)
General Values	Enduring principles guiding behaviour (biospheric, altruistic, egoistic).	Schwartz (1992); Stern et al. (1999); Schultz et al. (2005)
Social Norms	Perceived expectations or behaviours approved by others (descriptive & injunctive norms).	Goldstein et al. (2008); Bai & Bai (2020)
Attitudes Toward PEB	Positive/negative evaluation of performing environmentally friendly actions.	Chen & Chai (2010); Chen & Tung (2014); Janmaimool & Khajohnmanee (2019)
Environmental Awareness	Knowledge and understanding of environmental issues and human impact on nature.	Handoyo et al. (2021, Mkumbachi et al. (2024); Arya & Kumar (2023)

Table 4 presents the mean and standard deviation for each variable related to PEB. Both General Values and Social Norms recorded the highest mean of 4.14, with relatively low variation in responses. This is followed by Personal Norms with a mean of 4.06, and Attitudes Toward PEB is 4.02. While the Situation Factors recorded the lowest mean at 3.75.

Table 4. Descriptive Statistics for Pro-Environmental Behaviour Construct

Construct	Mean	Standard Deviation
Personal Norms	4.06	1.024
General Values	4.14	0.0853
Social Norms	4.14	0.938
Attitudes Toward PEB	4.02	0.822
Environmental Awareness	3.95	0.972

3.3 The Data Analysis

The hypotheses were tested using structural equation modelling (SEM) with a Partial Least Squares (PLS) approach. Data were analysed using SmartPLS 3.0 software (Ringle, 2005), with the application of bootstrapping techniques to assess the significance level of loadings, weights, and path coefficients (Ramayah et al., 2013). Then followed by a two-stage procedure proposed by Anderson and Gebing (1988), which is a test for validity and reliability of the measurement model, followed by an assessment of the relationships in the structural model.

3.3.1 The Measurement Model Assessment

The measurement model was assessed for reliability and validity before conducting the structural model analysis. As shown in Table 5, all items showed outer loading values exceeding 0.70, while the Composite Reliability (CR) and Cronbach's Alpha values also exceeded the threshold of 0.7 (Hair et al., 2021). The Average Variance Extracted (AVE) values for each construct also exceeded 0.5, thus confirming convergent validity (Bagozzi, 1988). Table 6 further shows that the AVE value for each construct is higher than the correlation with other constructs, confirming discriminant validity according to the criteria of Fornell and Larcker (1981). In addition, the cross-loading results in Table 7 show that each indicator loads higher on the contract it represents than on other constructs, confirming the differentiation of constructs as discussed and suggested by Hair (2014).

Table 5. Composite reliability, Outer Loading, and Average Variance Extracted

Construct	Items	Loading	Composite Reliability	Cronbach's Alpha	Average Variance Extracted
Attitude towards PEB	AT1	0.885403			
	AT2	0.878945			
	AT3	0.922202			
	AT5	0.886509	0.941	0.916	0.798
Environmental Awareness	EA1	0.905642			
	EA2	0.895247	0.935	0.907	0.781
	EA4	0.89749			

	EA5	0.83578			
General Values	GV1	0.830597	0.925	0.901	0.713
	GV3	0.845445			
	GV4	0.872815			
	GV7	0.853514			
	GV8	0.8177			
	LS3	0.938876			
	LS5	0.921277			
PEB	PEB_P1	0.867885	0.891	0.836	0.671
	PEB_P2	0.864103			
	PEB_P3	0.791143			
	PEB_P4	0.748345			
Personal Norms	PN1	0.87274	0.9	0.865	0.694
	PN3	0.901803			
	PN4	0.718412			
	PN5	0.827956			
	SF2	0.89653			
Social Norms	SN4	0.88045	0.928	0.867	0.867
	SN5	0.978891			

Table 6. Discriminant Validity

Constructs	Attitude towards PEB	Environmental Awareness	General Values	PEB	Personal Norms	Social Norms
Attitude towards PEB	0.893					
Environmental Awareness	0.679	0.884				
General Values	0.631	0.565	0.844			
PEB	0.309	0.226	0.227	0.819		
Personal Norms	0.455	0.369	0.51	0.374	0.833	
Social Norms	0.488	0.387	0.444	0.147	0.578	0.931

Table 7. Outer Loading

Items	Attitude towards PEB	Environmental Awareness	General Values	PEB	Personal Norms	Social Norms
AT1	0.885					
AT2	0.879					
AT3	0.922					

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AT5	0.887					
EA1		0.906				
EA2		0.895				
EA4		0.897				
EA5		0.836				
GV1			0.831			
GV3			0.845			
GV4			0.873			
GV7			0.854			
GV8			0.818			
PEB				0.868		
PEB				0.864		
PEB				0.791		
PEB				0.748		
PN1					0.873	
PN3					0.902	
PN4					0.718	
PN5					0.828	
SN4						0.880
SN5						0.979

3.3.2 Structural Model Assessment

Table 8. Significance Testing Results of the Structural Model

Hypothesis	Path Coefficient	Sample mean (M)	Standard deviation (STDEV)	T statistics	95% Confidence Interval		P-values
					Lower	Upper	
Attitude towards PEB -> PEB	0.111	0.106	0.082	1.353	-0.056	0.270	0.176
Environmental Awareness -> PEB	-0.013	-0.010	0.063	0.202	-0.132	0.113	0.840
General Values -> PEB	-0.073	-0.068	0.060	1.208	-0.185	0.052	0.227
Personal Norms -> PEB	0.386	0.383	0.061	6.325	0.257	0.498	0.000
Social Norms -> PEB	-0.236	-0.222	0.065	3.602	-0.345	-0.082	0.000

The structural model was evaluated using a bootstrapping procedure with 1,000 resamples to obtain the t-values. Table 8 presents the structural model results that showed significant differences in the strength and direction of the relationship between internal psychological factors and PEB among students. Personal Norms emerged as the strongest and most significant predictor ($\beta = 0.386$, $p<0.001$), with a clearly positive 95% confidence interval, confirming that an internalized sense of moral responsibility is a key driver for

promoting sustainable practices. Conversely, Social Norms demonstrated a moderately significant negative influence on PEB ($\beta = -0.236$, $p<0.001$), thus suggesting that social pressures in the current context have the potential to hinder, rather than support, sustainable behaviour.

DISCUSSION OF RESEARCH FINDINGS

4.1 Predictive Influence of Internal Psychological Drivers on Pro-Environmental Behaviour

This section addresses the first research objective by empirically examining the predictive influence of five core internal psychological drivers, which are the Personal Norms, General Values, Social Norms, Attitude towards PEB, and Environmental Awareness, on students' daily PEB.

The structural model analysis revealed a distinct hierarchy of influence. Personal Norms emerged as the most significant positive predictor of PEB ($\beta = 0.386$, $p<0.001$), unequivocally highlighting the critical importance of internalised moral responsibility in motivating students to adopt sustainable behaviours. This substantiates the concept of an intrinsic moral obligation acting as a reliable, internal feed-forward control mechanism for sustainable performance.

In contrast, Social Norms exhibited a statistically significant negative relationship with PEB ($\beta = -0.236$, $p<0.001$), suggesting that social pressures can sometimes prevent individuals from taking environmentally friendly actions. This finding is highly noteworthy as it diverges from conventional environmental psychology literature that typically positions descriptive and injunctive norms as positive catalysts for PEB adoption (Cedrún-Vázquez et al., 2025; Wu et al., 2024; Kácha & van der Linden, 2021). The contribution of this study is that it provides empirical substantiation within this specific HLI context, social pressures function as a deterrent, suppressing PEB by influencing individuals' perceptions of what is commonly done and accepted by their peers. This suggests that PEB may be currently viewed as an outlier behaviour, highlighting the presence of a strong negative cultural barrier.

Furthermore, the findings indicated that other measured factors, which are specifically Attitude towards PEB, Environmental Awareness, and General Values, yielded statistically weak or insignificant effects on students' daily PEB. This suggests that these three psychological drivers' influence is insufficient, in isolation, to translate knowledge or general positive sentiment into consistent daily PEB, thereby reinforcing the persistent 'Knowledge-Action Gap' discussed earlier. Collectively, these results underscore the complexity of the interaction between intrinsic motivation and prevailing social dynamics. This structural challenge requires educators and institutions to develop sustainable cultures through an approach that is highly sensitive to the negative influence of peer dynamics.

4.2 Data-Driven Recommendations for Enhancing Students' PEB and Strengthening ESG Assurance

This section addresses the second research objective, which is to develop practical, data-driven recommendations and NFI strategies for HLIs to enhance student PEB, thereby strengthening overall sustainability governance and ESG assurance. The recommendations are directly based on the empirical findings of the study, particularly the dominant role of Personal Norms and the unexpected, yet significant, negative influence of Social Norms. The research confirms that internal psychological factors are quantifiable predictors, making them ideal leading NFIs. The structural model reveals a critical dual challenge, which suggests that HLIs should strategically leverage the strong internal moral driver (Personal Norms) while simultaneously addressing the negative cultural barrier posed by Social Norms. By measuring these leading NFI inputs, HLIs can proactively assess the effectiveness of their governance and internal control environment before the lagging environmental outcomes (e.g., waste volume, energy consumption) are realised.

Based on the findings of this study, several evidence-based strategies and behavioural NFIs are recommended for HLIs to effectively foster PEB and strengthen sustainability accounting and ESG governance. The empirical results require a fundamental shift in intervention strategy, moving away from reliance on general information (Awareness on PEB) and external social pressure, which is currently suppressing PEB. Thus,

the strategies of HLI should move toward reinforcing individual moral commitment and re-engineering the campus culture and environment.

4.2.1. Targeted Interventions for Personal Norms (The Dominant Moral Driver)

Given that Personal Norms emerged as the strongest predictor of PEB, HLIs should consider giving greater attention to strategies that help nurture students' sense of moral responsibility and internal motivation. Approaches such as integrating ethical and environmental themes into the curriculum, encouraging reflective learning, and offering community-based sustainability activities may contribute to strengthening students' personal accountability toward environmental action. Corresponding behavioural NFIs may include measures such as the percentage of students participating in sustainability-oriented initiatives, self-reported environmental commitment indices, and frequency of voluntary pro-environmental acts on campus.

Since Personal Norms are often the most potent predictor, interventions should shift from rational appeals (knowledge) to moral and ethical appeals (Schwartz, 1992; Steg & Vlek, 2009). Other actions under Personal Norms that can enhance PEB among students are:

1. Formal Ethics Integration in Academic Curriculum: Integrate modules on sustainability ethics and personal accountability into the first-year curriculum or orientation program. Crucially, these sessions should ethically frame environmental action as an intrinsic moral duty to the campus, local community, and future generations, rather than simply a matter of compliance with HLI rules, while respecting student autonomy in their decision-making.

2. Moral Framing in Communication: All sustainability campaigns in HLI are advised to utilise a moral framing that links PEB directly to the student's identity as an ethical stakeholder. For example, replace technical messaging like "Reduce kWh" with ethical appeals such as "Your decision to switch off the light fulfils your moral duty to conserve shared resources." This must be done with transparency to avoid manipulative pressure.

3. Measurable Commitment Ceremonies: Introduce a voluntary, non-punitive *Sustainability Pledge* during registration, focusing on the moral obligation to protect the campus and the community, rather than rules compliance. This external commitment strengthens the internal norm. The non-punitive and voluntary nature of this pledge is paramount to upholding ethical standards and promoting genuine internalisation.

4. Role Model Integration: Actively recruit and promote students who demonstrate high PEB and articulate their actions as a moral duty, leveraging their example as an aspirational moral standard.

4.2.2 Interpretation and Nuance of Social Norms

The finding that Social Norms negatively influence PEB ($\beta = -0.236$) is highly significant but requires careful interpretation, as it runs counter to established theory. While the result strongly indicates that students perceive PEB as an isolating or culturally discouraged activity, this complex relationship must be examined through alternative lenses. The negative association may stem from factors such as misperceived norms (students overestimating peer apathy toward sustainability), genuine subgroup differences in norm adherence (where the peer influence is only negative in specific faculties or cohorts), or potential measurement bias related to social desirability in self-reported data. Future qualitative research is explicitly advised to fully explore the underlying reasons for this critical cultural barrier.

By measuring these leading NFI inputs, HLIs can proactively assess the effectiveness of their governance and internal control environment before the lagging environmental outcomes (e.g., waste volume, energy consumption) are realised.

4.2.3 Mitigating the Social Norms Barrier (The Cultural Risk)

The significant negative path coefficient for Social Norms suggests that PEB is currently perceived as an

outlier behaviour with high social cost that is being viewed as overly inconvenient or subject to peer judgment. Interventions should focus on removing this perceived social penalty, and HLIs may therefore design positive social influence mechanisms. Programs like peer-led sustainability campaigns, green ambassador programs, and visible recognition systems can reward environmentally friendly behaviours. These interventions can help reshape social norms to align with sustainability goals. Relevant accountability metrics could include peer influence scores, student perception surveys on environmental culture, and participation rates in sustainability recognition programs.

Social Norms are effective in the collective environment of a university. The HLI can intentionally shape the perception of what is "normal" and "approved" (Cialdini, 2003). Other actions under Social Norms that can increase PEB among students in HLIs are:

1. Visible Descriptive Norms: Publicize true, positive behaviours. For example, instead of focusing on poor recycling rates, state, "85% of UNISEL students bring reusable water bottles to class." This leverages the *descriptive norm* to make the desired behaviour seem common and expected.

2. Peer-to-Peer Intervention: Empower student sustainability clubs to run campaigns, as peer influence is more impactful than top-down administration directives. This supports the *injunctive norm* (what is approved) by demonstrating social sanction for PEB.

4.2.4 Managing Weak/Insignificant NFIs (General Values, Attitude, and Awareness)

Although Attitudes toward PEB, Environmental Awareness, and General Values exhibited comparatively weaker effects, their potential relevance over the longer term should not be overlooked. The modest influence of these factors suggests that information provision and positive messaging alone may not be enough to encourage consistent behavioural change. HLIs may therefore consider strengthening ongoing environmental education, incorporating experiential learning opportunities, and refining communication strategies to better support the translation of awareness into practice. Possible behavioural NFIs applied with care and without implying direct influence could include environmental literacy indicators, records of sustainability-related workshops, and student self-reports of confidence in applying sustainable practices.

These factors are strongly recommended to serve as preconditions or diagnostics, not primary intervention targets, for resource allocation. Recommendations should focus on improving the situational context to make the desired behaviour the default choice. Actions that can increase PEB among students in HLIs are:

1. Infrastructure as a Nudge (Environmental Awareness): Systematically audit and improve campus facilities to lower the effort required for PEB. These examples include locating accessible, clearly marked recycling bins *next to* every general waste bin (not distant from them) and pre-setting photocopiers and computer lab printers to double-sided printing as the default option.

2. Instantaneous, Positive Reinforcement (General Values): Implement digital dashboards in residential colleges showing real-time, comparative energy or water consumption, coupled with positive recognition for high-performing floors or blocks, thereby reinforcing the positive attitude towards resource conservation.

3. Focus on Specificity (Attitude towards PEB): Interventions aimed at attitude are strongly recommended to be hyper-specific and linked to immediate benefit. For example, "Using the smart tap saves water and reduces campus operational costs, which benefits your facilities fund," rather than the generic message of “saving the planet."

4.2.5 Strengthening Sustainability Governance and ESG Assurance

The implementation of these NFIs provides a robust mechanism for the governance structure to enhance its ESG assurance capability, moving beyond basic compliance reporting. The leading metrics are essential for

enhancing ESG assurance, particularly in the behavioural domain (Social and Environmental pillars). Some methods that can strengthen the sustainability governance and ESG assurance in HLIs are as below:

1. Formal Integration into the Governance Dashboard: The Internalized Obligation Index and Program Receptivity Score are recommended to be formally included in the quarterly reports provided to the University's Sustainability Committee or Board of Governors. This ensures behavioural performance is assessed alongside traditional financial and operational metrics.

2. Enhanced Behavioural Control Reporting: The validated NFIs provide a quantifiable measure of the HLI's human capital control environment within the "Social" pillar of ESG. Assurance providers can use the trending NFI scores as evidence to support or to verify the efficacy and commitment of the HLI's internal controls regarding student behaviour, thereby supporting the leading NFIs disclosure. This approach offers a basis for improved confidence in behaviourial data as a leading NFI in sustainability reporting.

3. Resource Allocation Strategy: Governance can utilize the relative predictive strength (path coefficients) of the NFIs (e.g., if Personal Norms are twice as strong as Awareness) to reallocate funds. This guarantees that resources are directed toward strengthening the most impactful psychological drivers (e.g., moral appeals) rather than less effective avenues (e.g., generic awareness campaigns), maximizing the return on investment for sustainability initiatives.

CONCLUSION

Overall, the study underscores the necessity of integrating behavioural insights into a sustainability governance framework and validating the predictive power of internal psychological drivers over traditional knowledge-based approaches. By systematically tracking behavioural NFIs aligned with the Theory of Planned Behaviour and the Value-Belief-Norms Theory, the findings from this Malaysian HLI context indicate that institutions can not only assess progress in promoting PEB but also embed sustainability as a measurable and reportable component of their non-financial performance. The study reveals a dual challenge where the HLI should leverage the strong internal moral driver of Personal Norms while simultaneously mitigating the negative cultural barrier of Social Norms.

5.1 Theoretical Contribution and Empirical Insights

This study offers two significant empirical refinements to the environmental psychology and sustainability literature, particularly within the HLI setting. Firstly, the primary empirical insight is the dominant predictive power of Personal Norms, confirming its role as the most robust leading NFI in driving consistent daily PEB. This finding fundamentally mandates that institutional policy should prioritise the cultivation of internal ethical commitment (moral obligation) over generic attitude or knowledge campaigns, thereby maximising the return on behavioural investment.

Secondly, the statistically significant and unexpected negative influence of Social Norms provides a crucial, context-specific insight into cultural barriers. This result indicates that within the tested HLI culture, PEB is currently perceived as an outlier behaviour subject to peer disapproval, demonstrating that external social pressure, typically viewed as a positive motivator, is instead functioning as a significant cultural risk and active barrier to PEB adoption. Finally, the concurrent finding of the limited direct influence of General Values, Attitude towards PEB, and Environmental Awareness further reinforces the critical 'Knowledge-Action Gap', cementing the fact that simple information dissemination alone is ineffective. However, caution is advised against broad generalisation of these findings without further replication across diverse institutional contexts.

5.2 The Core Proposition: Integrating Psychological Drivers as Leading NFIs

Methodologically, this study provides a crucial, data-driven framework for Sustainability Accounting and ESG Governance. The empirical validation confirms that internal psychological factors are not merely latent variables but quantifiable predictors, making them ideal Leading NFIs (Kaplan & Norton, 1996). By

establishing the predictive strength of the psychological constructs, the research lays the statistical foundation required to translate these factors into reliable, leading NFIs and directly addresses the pervasive assurance deficit in non-financial reporting. Crucially, while the formal inclusion of these validated psychological drivers as key leading NFIs within the HLI accountability framework is proposed, their deployment as policy instruments (e.g., in framing or pledges) must be ethically governed. Future policy design based on these NFIs must carefully navigate the boundaries of student autonomy, explicitly acknowledging the potential for unintended pressure and prioritising the reinforcement of intrinsic motivation over coercive compliance mechanisms. This proposition repositions performance measurement by shifting focus from measuring historical outputs to measuring predictive inputs:

1. Predictive Capability and Assurance: By establishing the predictive strength of Personal Norms and the cultural risk of Social Norms as measurable NFIs, governance bodies can measure behavioural inputs proactively rather than merely reacting to environmental outputs. This enables a higher level of credibility and external assurance in ESG disclosures, as the institution can report on the internal commitment and behavioural drivers, which are the true markers of an Internalising ESG strategy.

2. Strategic Resource Reallocation: The findings suggest a strategic shift in organisational resource allocation. Investment is strongly recommended to pivot away from ineffective awareness campaigns and be heavily weighted toward moral reinforcement that strengthens the NFI (Personal Norms) through targeted ethics modules and moral framing. Conversely, active cultural risk mitigation is required to normalise PEB and address the negative influence of Social Norms.

3. Human Capital Accountability: The framework provides robust evidence-based tools necessary to enhance the credibility and predictive capability of sustainability and ESG performance reporting, particularly by providing a quantifiable metric for the Social (S) pillar of ESG through the quality of the HLI's human capital disposition.

In summary, this framework provides a significant methodological contribution by integrating psychological theory into the performance management architecture, offering HLIs an advanced, quantifiable solution for robust sustainability accounting and ESG assurance.

LIMITATIONS AND FUTURE RESEARCH

Despite the rigorous quantitative analysis and the development of a robust predictive model, this study is subject to limitations, primarily its cross-sectional design and the single-institution context. Future research is, therefore, encouraged to proceed in two critical directions:

Firstly, to address the methodological limitations inherent in cross-sectional data, future studies should consider employing longitudinal designs to track changes in NFI scores and PEB adoption over time, thereby strengthening the empirical foundation for establishing temporal precedence and predictive validity. This level of analysis is crucial for providing concrete, time-series evidence that justifies the initial resource allocation and policy implementation.

Secondly, future research is strongly recommended to integrate the internal psychological NFIs from the current study with the external institutional factors (such as Situational Factors and Leadership Behaviour). This comprehensive, multi-level modeling approach could establish a truly holistic control system, providing university governance with the complete map of both the leading internal behaviour NFIs and the external structural NFIs required for comprehensive and durable sustainable performance.

In conclusion, this research provides HLI governance with the evidence-based tools necessary to treat behavioural inputs as quantifiable NFI. By prioritizing the cultivation of Personal Norms and the urgent mitigation of negative Social Norms, HLIs can ensure their sustainability policies are not only well-intended but are also highly effective, measurable, and ultimately accountable to stakeholders under the modern ESG reporting mandate.

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