

ADVANCING THE SUSTAINABLE DEVELOPMENT GOALS THROUGH GREEN UNIVERSITIES: PROMOTING SUSTAINABLE LIFESTYLES IN THAI HIGHER EDUCATION

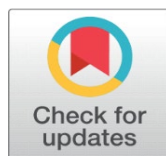
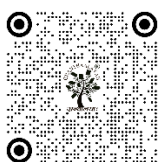
Md Miran Hasan ¹✉, Sun Jin ², Thao Tran ³, Dowroong Watcharinrat ⁴

¹ Faculty of Education, Shinawatra University, Thailand

² Faculty of Transnational Education, Shinawatra University, Thailand

³ Faculty of Transnational Education, Shinawatra University, Thailand

⁴ Faculty of Education, Shinawatra University, Thailand



ABSTRACT

Universities are being seen more widely as key institutional actors in delivering on the SDGs by providing students with sustainability information, values and behaviour. The expansion of green university initiatives in Thailand has been seen due to rising environmental awareness and a national pledge towards sustainability. But little empirical attention provided to how institutional sustainability initiatives affect student sustainability-related lifestyles in the Thai higher education context.

This research examines the potential of green universities in Thailand for environmentally responsible and sustainable livelihoods among students. Based on Theory of Planned Behavior (TPB) and an institutional context perspective, the study investigates how sustainability knowledge impacted sustainable attitudes, green campus practices, curriculum integration & student engagement and eventually sustainable lifestyle behaviours.

It was a qualitative and quantitative research design. Method: Quantitative data were collected via structured questionnaire among 100 undergraduate and postgraduate students from Shinawatra University compared with the insights from other institutions (Chulalongkorn University + Kasetsart University). Relationships between the main variables were assessed using descriptive and correlational analyses and qualitative responses given at end of survey, regarding institutional enablers and barriers to sustainable lifestyle adoption, were thematically analysed.

The results show that the students tend to have positive sustainability knowledge and attitudes; but sustainable lifestyle behaviours are at a comparatively moderate level, reflecting an intention-behaviour gap. Positive associations were seen between institutional factors such as visible green campus infrastructure, indicators of curriculum integration related to sustainability and active student engagement with sustainable lifestyle practices. Qualitative results further identified poor sustainability infrastructure, lack of institutional visibility and time constraints as drivers inhibiting the behaviours.

This study makes a contribution to the sustainability and higher education literature by offering empirical evidence from a Southeast Asian context, and underlining the role of institutional environments in operationalising knowledge-to-know translations into everyday behaviours. The results indicate that when coherently implemented within CESE, integrated sustainability strategies can increase the contribution of universities to SDG 4, SDG 12 and SDG 13.

Keywords: Green universities, Sustainable development goals, Sustainable lifestyles, Higher education for sustainable development, Campus sustainability, Thailand

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Corresponding Author

Md Miran Hasan,

miran.smartbrain@gmail.com

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1. INTRODUCTION

Sustainability is regarded one of the greatest global challenges of the 21st century as environmental, social and economic problems (such as climate change, biodiversity loss, resource scarcity and unsustainable consumption) are intensifying. These challenges are not only increasingly recognized as environmental or technological but also behavioural and institutional problems deeply rooted in everyday lifestyles, production systems and social practices. Such complex sustainability problems thus will need not only technological innovation and policy reform but also change in human beings, i.e., long-term change of values, attitudes, and behaviours. Remarkably, education has broadly been acknowledged as a vital element for sustainable development because it influences individuals' knowledge, competencies and worldview (UNESCO, 2020) in this respect.

The role of higher education institutions appears even more critical in contributing to advancing sustainable development. Universities are not only sites for producing new scientific and technical knowledge, but social environments in which students forge the habits, beliefs and forms of behaviour that carry on into adulthood—ideally conducive to good citizenship and a rich communal life. As a result, universities are now more than ever expected to directly contribute towards the fulfilment of the Sustainable Development Goals (SDGs) through their teaching, research, campus operation and society engagement. Specifically, Education for Sustainable Development (ESD) is promoted more in SDG 4 while the other two SDGs shown responsible consumption and production with respect to climate action (SDG 12; United Nations, 2015). Consequently, the perceptions of higher education institutions as vehicles translating sustainability principles into action has gained traction.

In this larger framework, the idea of the "green university" has materialised as an institutional pathway towards sustainability in higher education. Green universities aim to promote sustainability principles across all dimensions of university life, such as campus infrastructure, governance mechanisms, academic curricula, research activities and student engagement. The green university model is not merely about managing sustainability as an environmental problem, however, but rather offers a concept of a comprehensive institutional framework in which sustainability is implemented into everyday university academic and operational practices. This may turn universities into "living laboratories", where students are exposed to norms, values and behavioural experiences for sustainability.

It has already been established in the literature that sustainability knowledge and environmental attitudes are key factors influencing pro-environmental behaviour [8,9]. Curricula that promote sustainable development, green campus infrastructure, and institutional environmental initiatives can all positively impact student awareness and attitudes towards sustainable development. Yet other research shows a continuing intention-behaviour gap, whereby students signal high levels of environmental concern and sustainability attitudes but do not achieve sustainable lifestyle actions. In this regard, Kollmuss and Agyeman (2002) have highlighted limited institutional support, lack of sustainability infrastructure, inconvenience and time constraints as the barriers restricting what they refer to as positive attitudes transforming into sustainable behaviour. This is misleading because it shows that institutional contexts can help as well as hinder the use of sustainable lifestyles.

Thailand is an important setting for investigating the relationship between green universities and sustainable lifestyles. Economic growth in the name of development as coupled with rapid urbanization and changing consumption patterns have led to unprecedented environmental pressures across the country. Meanwhile, Thailand's national development agenda is becoming more and more oriented towards sustainability, environmental preservation and social well-being. Also the Sufficiency Economy Philosophy which King Bhumibol Adulyadej aspires to be characterized by moderation, resilience and responsible resource utilization is directly related to some principles of sustainable development and sustainable living. These contextual factors render Thai universities a particularly important sites for research on how institutional sustainability initiatives affect student behaviour.

Even though Thai higher education has received greater attention to sustainability policy and initiatives, empirical studies on green university practices and student sustainable lifestyle behaviour outside the classroom remained limited. Most research to date has been predominantly on institutional sustainability policies, more green campus rankings, environmental management systems (MS), but far less on students' sustainability knowledge, attitudes and behaviour outcomes. Moreover, prior studies have focused almost exclusively on large state universities and comparatively few research efforts have examined smaller private colleges. This gap limits understanding of the institutional determinants that influence Thai students' behaviours in relation to sustainability.

The current study fills these gaps by examining the roles of green universities in supporting sustainable lifestyles among students in Thai higher education institutions. This study — whilst using comparative insights from Chulalongkorn University and Kasetsart University, mainly concentrates on Shinawatra University and the relationships between sustainability knowledge, sustainability attitudes, institutional sustainability practices, integration of curriculum towards sustainability concepts into teaching-learning processes through student engagement in school initiatives for sustainable lifestyles behaviours. An exploratory mixed-methods approach based on Theory of Planned Behavior (TPB) will be utilised in order to gain empirical insights into the institutional conditions that aid sustained behavioural change at HEIs.

This study draws from the literature a tripartite contribution. Firstly, it adds empirical data from a Southeast Asian context, which is rather rare in the literature on green universities and sustainable lifestyles. Third, the research contributes to our understanding of how institutional practices related to sustainability may affect students behaviours on a daily basis through investigating an interaction between personal attitudes and institutional contexts. Third, by incorporating the Theory of Planned Behaviour and an institutional sustainability perspective into a theoretical framework on how universities can bridge the intention-behaviour gap through higher education to support progress towards sustainable development goals.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. HIGHER EDUCATION AND THE SUSTAINABLE DEVELOPMENT GOALS

By virtue of their potential to shape the knowledge, values and practices of students (Wagner & Wiek 2018) higher education institutions are increasingly seen as key players in achieving sustainable development. As guided by the 2030 Sustainable Development Goals (SDGs), universities are expected to do more than offer academic instruction: through sustainability-oriented education, research and institutional practice, they must be active facilitators of societal change. SDG 4 focuses specifically on Education for Sustainable Development (ESD), SDG 12 (Responsible Consumption and Production) promotes environmentally responsible behaviours, and SDG 13 (Climate Action) is centered in an advocacy for behavioural change of individuals.

It has been found that universities affect sustainability by impacting multiple interconnected dimensions such as curriculum choices, campus management and governance systems, and student engagement activities (Boni & Velazquez, 2016). Education focused on sustainability improves students understanding of environmental and social challenges, whereas institutional sustainability initiatives offer faculty and students opportunities to experience sustainable practices in their daily lives (Cortese, 2003; Lozano et al., 2015). Higher education institutions are therefore perceived as important settings for promoting the adoption of sustainable lifestyles among young adults.

Because students are in a stage of their life where they adopt long-standing habits, identities and behavioural norms, several authors suggest that universities have a special responsibility (Stephens et al. 2008). Thus, in formal and informal learning environments, universities may influence not only students' academic knowledge but also environmental stewardship and sustainable consumption patterns. This approach casts higher education institutions as key drivers of social change for sustainability.

2.2. GREEN UNIVERSITIES AS INSTITUTIONAL SUSTAINABILITY ACTORS

The green university concept has evolved in response to global recognition of responsibilities and accountability of universities. Green universities attempt to embed sustainability principles into all aspects of the institution: physical and infrastructure, governance, teaching and learning, research, and community engagement (Disterheft et al., 2012). Instead of regarding sustainability as an "environmental issue," the green university model promotes a holistic, institutional one where sustainability is embedded into campus culture and operations.

Therefore green universities are called "living laboratories" because they facilitate direct exposure of students to sustainability-oriented systems (Purcell et al., 2019). These may include, for example, recycling systems, renewable energy and zero-energy buildings, green transportation policies or sustainable building design practices regarding the use of materials and energy or environmental awareness programs. Such institutional practices can be visible formers of social norms in these settings and hence predispose students to adopting sustainable lifestyle as part of their life.

Published research suggests that institutional efforts at sustainability may promote student environmental attitudes and behaviours. Visibility of green infrastructure and governance for sustainability can strengthen the perception that sustainability is more than a theoretical concept but rather an institutional value (Findler et al., 2019). In addition, a commitment to sustainability from the college and university often promotes student awareness and involvement in environmental projects. Consequently, another element of the green university deliberation is its unique institutional context as a locus for instituting sustainable behavioural change.

2.3. SUSTAINABILITY KNOWLEDGE, ATTITUDES, AND LIFESTYLE BEHAVIOUR

As a broad area of research with respect to environmental education and sustainability, the relationship between sustainability knowledge, attitudes–behaviour has frequently been the focus of many studies. Sustainability Knowledge is the knowledge that people have about environmental problems, sustainable development concepts and practices of resource wise use. A better understanding of sustainability is typically correlated with increased concerns for the environment as well as a higher awareness about sustainability-related challenges (Rieckmann, 2012).

Sustainable attitudes indicate what individuals believe and find valuable or positive surrounding sustainable development and environmentally responsible behaviours. Prior studies have indicated that positive environmental attitudes are strong predictors of behavioural intention and pro-environmental behaviours (Sanchez et al., 2020). Students exhibit more willingness to cooperate with measures for the protection of the environment, environmentally-friendly consumption and climate action if they have strong sustainability attitudes.

Yet the literature suggests a persistent intention–behaviour gap in sustainability behaviour. Despite strong knowledge about the environment and positive attitudes towards sustainability, individuals do not often practice consistency characteristics of a sustainable lifestyle (Kollmuss & Agyeman, 2002). This gap is often attributed to contextual and institutional factors, consisting of absence of infrastructure, inconvenience in attending to institutional support, money and time constraints. As a result, individual behaviour cannot be explained only by individual attitudes; it can also be influenced at institutional and environmental level.

2.4. STUDENT ENGAGEMENT AND CURRICULUM INTEGRATION

It is generally recognized that student engagement is one of the most important mechanisms through which institutional sustainability activities affect behavioural outcomes[10]. Engagement in sustainability relevant activities such as environmental clubs, campus projects, workshops and community outreach programs comprise experiential learning that reinforce identities and behavioural practices consistent with sustainability (McMillin & Dyball, 2009).

Studies also show that students engaging in sustainability activities are more likely to embrace eco-friendly values and incorporate environmentally sound behaviours into their lives. Experiential learning opportunities help students get out of their heads and put sustainability principles into practice through practical context. This kind of participation also strengthens the social norms that motivate sustainable behaviour.

An additional key component of sustainability education is curricular integration. At its core, ESD promotes an interdisciplinary and critical approach to environment and development (tilbury, 2011)—sustainability concepts are addressed through the practical application of knowledge. Through curriculum crawl the spirit of sustainability themes goes across multiple academic disciplines, helping students to deepened understanding regarding environmental and social challenges that require sustainable decision making.

However, if sustainability is integrated fragmentedly or superficially into curricula, the sustainability education may lose effectiveness. By only incorporating it into a handful of courses and managing it as nugget-content, students find it hard to relate sustainability both with their lifestyles today and the professional expectations that lie ahead of them. This suggests that in order to achieve sustained behaviour change, there is a need for systematic curriculum integration.

2.5. THEORETICAL FRAMEWORK: THEORY OF PLANNED BEHAVIOR AND INSTITUTIONAL CONTEXT

This research utilized the Theory of Planned Behaviour (TPB), as its main theoretical framework, along with an institutional discussion context to predict sustainable lifestyle behaviour in green university settings. The Theory of

Planned Behaviour TPB was developed by Icek Ajzen, which states that behaviour is influenced by three main factors; attitudes towards the behaviour, subjective standards and perceived behavioural control.

TPB asserts that people are more likely to perform a behaviour if they have positive intentions toward the behaviour (attitude), perceive social pressure not to do it (subjective norms) and believe they have the ability and resources available to successfully enact the behaviour (perceived behavioural control). TPB has been extensively used in the context of pro-environmental behaviour studies (e.g. sustainable consumption, environmental decision-making).

In the context of green universities, institutional sustainability practices can shape each of the three components of TPB. Positive sustainability attitudes may be reinforced by curricula and educational activities with a focus on sustainability. Institutional policies, peer effects and campus sustainability culture may enable perceived norms that favor sustainable lifestyle choices. Similarly, tangible visible systems (e.g. recycling opportunities) and further provision of participation opportunities may lead to higher perceived behavioural control by lowering practical constraints to sustainable behaviour.

This study proposes that through TPB in combination with an institutional perspective, the establishment of green universities may promote the enactment of sustainability attitudes onto sustainable lifestyle behaviours by enabling conducive educational and environmental conditions.

2.6. HYPOTHESES DEVELOPMENT

Specifically, the following hypotheses are put forth based on the synthesized literature and the TPB-derived institutional framework:

H1: Sustainability knowledge influences students' sustainability attitudes positively.

H2: The more positive students' sustainability attitudes are the more sustainable lifestyle behaviours they exhibit.

H3: The institutional practices of the green university are positively correlated with students' sustainable lifestyle behaviours.

H4: Curriculum integration of sustainability has a positive link to sustainability attitudes and sustainable lifestyle behaviours.

H5: Sustainable lifestyle behaviours are positively related to student engagement in sustainability-related activities.

H6: Environmental behaviour of students is mediated by sustainability practices at campus, curriculum integration and student engagement

These hypotheses outline the theoretical framework for the empirical study that follows.

3. METHODOLOGY

3.1. RESEARCH DESIGN

This research used a mixed-methods design to examine the links between green university initiatives and students' sustainable lifestyle behaviours in Thai higher education institutions. A mixed-methods approach was deemed warranted because sustainability knowledge, attitudes and behaviours derive from both quantifiable institutional factors and social meanings related to an individual experience. Thus, this hybrid study that incorporated both quantitative and qualitative methods yielded a greater understanding of how institutional sustainability practices shape students sustainable lifestyles.

The background of the quantitative aspect of the research was developed under the influence of Theory of Planned Behavior (TPB) for establishing associations between sustainability knowledge, sustainability attitude, institutional sustainability practices and sustainable lifestyle behaviours. The qualitative component provided additional insights to the quantitative results by investigating students beliefs about facilitators and barriers in adopting a sustainable lifestyle within university contexts.

Using this convergent mixed-methods design, both quantitative and qualitative data were collected and considered jointly to develop a more nuanced understanding of sustainability practices in higher education settings.

3.2. STUDY CONTEXT AND RESEARCH SITES

This study was undertaken among universities in Thailand with different levels of engagement with institutional sustainability. Research Sampling and Data Collection The main site selected for data collection was Shinawatra University, because of the increasing institutional interest in sustainability in this type of institution as well its position as a smaller private university in Thailand.

In addition, to offer wider institutional viewpoints, comparative information was obtained by looking at student views of sustainability initiatives at Chulalongkorn University and Kasetsart University, both known for having existing green campus programs and sustainability initiatives.

The inclusion of both private and public universities allowed for representative institutional diversity within Thai higher education and enhanced the contextually-relevant results.

3.3. PARTICIPANTS AND SAMPLING

The sample consisted of 100 students (undergraduate and postgraduate) studying in Thai higher education institutes. The participants took part in the task were from different background, including environment studies, engineering, business and social sciences. The diversity encompassed a variety of perspectives regarding sustainability knowledge, attitudes and lifestyle behaviours.

Participants were recruited using a purposive sampling technique targeting individuals currently engaging with university learning environments who, by virtue of their positions in universities -- academia or administration -- would have had very intimate knowledge of sustainability practices on their campuses. Participants were required to fulfil at least one of the following criteria:

- Take-Up of Sustainability and Environmental Courses;
- involvement in extra-circular activities focused on sustainability; or
- participation in campus life and university events.

Because of the exploratory nature of this research, as well as the relatively small sample size, this study was primarily intended to explore tentative relationships between sustainability knowledge, institutional practices and sustainable lifestyle behaviours in Thai higher education.

3.4. DATA COLLECTION INSTRUMENTS

A structured questionnaire, adapted from existing sustainability education and higher education literature, was used to collect the data. The major change that was made to SushiQ was contextualised it as the Thai University.

The instrument we used for the survey was mainly to cover four sections:

1) Demographic Information

This section gathered students' background, including their university and field of study. These variables were included only as sample descriptors.

2) Sustainability Knowledge

The first section assessed the comprehension of sustainability concepts, environmental issues, climate change aspects, resource conservation knowledge and responsible consumption practices. The items measured participants' cognitive awareness of the principles associated with sustainable development.

3) Sustainability Attitudes

In this domain, students 121 answered questions about their attitudes, beliefs and value in regard to sustainability and environmentally morally responsible actions. The items captured the attitudinal aspect of the Theory of Planned Behavior and surveyed participants on their willingness to adopt sustainable behaviours.

4) Sustainable Lifestyle Behaviours

Sustainable lifestyle practices: This part of the questionnaire searched for students' self-declared green behaviours, e.g not wasting energy, living with less rubbish generated and recycling actions, as well as responsible purchases and engagement in sustainability activities.

For all of the questionnaire items were measured on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree.

3.5. PILOT TESTING AND RELIABILITY

Before the main data collection, we pilot-tested the questionnaire with a small group of university students to check clarity, relevance and contextual appropriateness. The wording of the items was refined based on the findings from a pilot study, in which respondents were asked to interpret their personal meaning for each item (October 2023).

Cronbach's alpha was used to analyse internal consistency reliability of measurement scales. With respect to multi-item constructs, all measures have Cronbach's alpha values above the accepted threshold level of 0.70 for reliability and internal consistency required for further analysis.

3.6. DATA COLLECTION PROCEDURE

The online questionnaire was conducted through a digital survey platform to ensure accessibility and anonymity for the respondents. Survey links were circulated via university communication channels and student networks.

The study was conducted entirely voluntarily. Participants were informed into the purpose of the research, that their responses would remain confidential and that they could withdraw from participation in this study at any time with no negative consequences before completing the survey. All participants provided electronic informed consent prior to the start of data collection.

3.7. DATA ANALYSIS

Quantitative data were analysed in IBM SPSS Statistics. Students sustainability knowledge, sustainability attitudes and sustainable lifestyle behaviours were summarised by descriptive statistics (means and standard deviations).

The internal consistency for the measurement scales was evaluated using a Cronbach's alpha reliability analysis.

Pearson correlation analysis was performed to explore relationships between sustainability knowledge, sustainability attitudes, institutional variables and sustainable lifestyle behaviour. Also, a multiple regression analysis was used to explore the predictive role of sustainable attitudes, curriculum incorporation, green campus practices and also student engagement towards sustainable lifestyle behaviours.

Moderation analysis was used to explore whether institutional factors can alleviate the intention-behaviour gap by acting as a moderator of the relationship between sustainability attitudes and sustainable lifestyle behaviours. Statistical significance was tested at the $p < .05$ level.

Thematic analysis was performed on open-ended qualitative responses to survey questions. Data were coded and organized into themes pertaining to facilitators of and barriers to sustainable lifestyles in a university context.

3.8. ETHICAL CONSIDERATIONS

The research reported in this study complied with ethical standards for human participation in social science research. Informed consent was obtained from all respondents, and participation was voluntary.

No personally identifiable information was collected, and all responses were kept confidential. Data were stored securely and only used for academic research purposes. They were told they could withdraw from the study at any point without punishment.

4. RESULTS

4.1. PARTICIPANT CHARACTERISTICS

In total, 100 undergraduate and postgraduate students took part in this study. The participants hailed from fields ranging from environmental studies, engineering, business, and social sciences. This study drew on students from different academic fields, enabling multiple perspectives on sustainability knowledge, attitudes and sustainable lifestyle behaviours in Thai higher educational institutions.

The respondents also displayed diverse familiarity with sustainability-related education and campus sustainability efforts. It improved the exploratory nature of this study and allowed for an examination of sustainability perceptions across different institutions and disciplines.

4.2. DESCRIPTIVE ANALYSIS OF SUSTAINABILITY KNOWLEDGE, ATTITUDES, AND BEHAVIOURS

In order to measure students' levels of sustainability knowledge, sustainability attitudes and sustainable lifestyle behaviours in the study, descriptive statistical analytics were performed.

Results showed that the students possessed a sustainable literacy from moderate to high level. The majority of respondents stated that they knew about environmental issues, sustainable development concepts, climate change, responsible resource use and environmental protection practices. In the overall, students expressed cognizance about sustainability concepts like waste reduction, energy conservation and responsible consumption.

Likewise, students had also a very positive attitude toward the sustainability. Most participants strongly agreed with statements about environmental responsibility, social sustainability, and the need for sustainable development. These findings indicate that students generally held positive perceptions of sustainability and a basic understanding of the connection between environmental responsibility.

In contrast, the sustainable lifestyle behaviours were relatively less consistent. While a considerable proportion of students did report some pro-environmental behaviours (e.g. recycling, energy conservation), there were not many participants who incorporated sustainable practices routinely into their daily lives. This implies an intention-behaviour gap, where positive sustainability attitudes do not always lead to sustainable behaviour.

4.3. RELATIONSHIPS AMONG SUSTAINABILITY KNOWLEDGE, ATTITUDES, AND BEHAVIOURS

This involved using Pearson correlation analysis to study sustainability knowledge, the Theory of Planned Behavior framework including sustainability attitudes and sustainable lifestyle behaviours.

The results showed that sustainability knowledge positively related to sustainability attitudes ($\beta = 0.737$, $p < 0.01$), thereby confirming Hypothesis 1. Results showed that students with superior sustainability knowledge exhibited significantly more positive attitudes toward sustainable development and environmental accountability than their peers.

Specifically, sustainability attitudes were strongly and positively correlated with sustainable lifestyle behaviours ($r = .48$, $p < .001$). Students with a better pro-sustainability attitudes were also associated with more sustainable lifestyle behaviours (e.g. reducing energy, recycling and responsible consumption behaviours). This finding supports Hypothesis 2.

However, the weak-moderate strength of this relationship indicates that positive attitudes do not fully account for adoption of sustainable behaviours. These findings also lend additional support to the presence of an intention-behaviour gap, indicating that further institutional and contextual determinants may mediate sustainable lifestyles among students.

4.4. INSTITUTIONAL FACTORS AND SUSTAINABLE LIFESTYLE BEHAVIOURS

We performed a multiple regression analysis of institutional sustainability factors on the students' sustainable lifestyle behaviours.

An extensive survey was conducted from a sample of 701 Chinese university students, which found that green campus practices served as considerable positive predictors for sustainable lifestyle behaviours ($\beta = .62$, $P < .005$). Also, students who reported being more exposed to visible sustainability initiatives (e.g. recyclables on campus, energy-saving systems, green infrastructure) were more likely to perform the sustainable lifestyle practices. This supports Hypothesis 3 and indicates that institutional sustainability environments influence student behaviour.

In parallel, sustainability attitudes and sustainable lifestyle behaviours were eminently predicted by curriculum integration of sustainability ($\beta = .37$, $p < .01$). Students who encountered sustainability principles in several different classes were much more likely to demonstrate sustainability-oriented attitudes and behaviours. More importantly, this supports H4 and reflects how Education for Sustainable Development from universities curriculum contribute.

Student engagement in sustainability activities was also a strong predictor of sustainable lifestyle behaviours ($\beta = .29$, $p < .05$). Students who were involved in sustainability projects, workshops or environmental initiatives during college practised more sustainable lifestyle choices. These results confirm Hypotheses 5 and further underline the need for experiential learning opportunities.

Moderation analyses also revealed that, in terms of institutional sustainability factors, institutional sustainability factors partially moderated the relationships between sustainability attitudes and sustainable lifestyle behaviours. Practices supporting green campus infrastructure, curriculum integration, and opportunities for student engagement seemed to help close the intention-behaviour gap by establishing supportive system conditions for sustainable behaviour. Thus reaffirmed Hypothesis 6 to a certain extent.

4.5. QUALITATIVE FINDINGS: ENABLERS AND BARRIERS

Qualitative responses were used for thematic analysis where several key drivers concerning sustainable lifestyle adoption among students were identified.

Enablers of Sustainable Lifestyle Behaviour

Participants named these institutional factors as key facilitators of sustainable behaviour:

- Transparency and easy access of sustainability infrastructure on campus;
- Implementation of activities related to sustainability concepts in teaching practice and learning;
- ways students can get involved in sustainability;
- prosocial peer norms; and sustainability-focused social norms,

The students indicated finding it easier to adopt sustainability practices where institutional support and infrastructure were readily apparent and accessible in campus environments.

Barriers to Sustainable Lifestyle Behaviour

Some barriers of sustainable behaviour were also highlighted as follows:

- Insufficient or inconsistent sustainability infrastructure;
- Academic workload and time constraints;
- perceptions of the inconvenience of sustainability;
- Limited understanding on sustainability initiatives.

Participants noted sustainability efforts at times wove through the university ecosystem but were often disjointed or inadequately communicated. These barriers limited students to transfer their sustainability attitudes into consistent sustainable lifestyle practices.

Hence the qualitative findings properly integrate and contextualise the quantitative results by showing how, in cases with more complex sustainability attitudes institutional conditions might actually support or inhibit that translation into everyday behaviour.

4.6. SUMMARY OF HYPOTHESIS TESTING

In summary, the results offered considerable empirical evidence for the hypothesized theoretical model. Sustainability knowledge, sustainability attitudes, sustainable behaviours related to green campus practices and the

integration of sustainability in curriculum and student engagement were all positively associated with sustainable lifestyle behaviours.

Hypothesis testing summary is given below:

Hypothesis	Relationship	Result
H1	Sustainability Knowledge → Sustainability Attitudes	Supported
H2	Sustainability Attitudes → Sustainable Lifestyle Behaviour	Supported
H3	Green Campus Practices → Sustainable Lifestyle Behaviour	Supported
H4	Curriculum Integration → Sustainable Lifestyle Behaviour	Supported
H5	Student Engagement → Sustainable Lifestyle Behaviour	Supported
H6	Institutional Factors Moderate Intention–Behaviour Gap	Partially Supported

Taken together, these findings indicate an important avenue through which institutional sustainability practices may help enhance students' stable and positive ethos toward sustainable lifestyles while closing the existence gap between sustainability attitudes and actual behaviour practices in universities.

5. DISCUSSION

This research aims to promote sustainable lifestyle behaviors of students in Thai higher education institutions by integrating the Theory of Planned Behavior (TPB) with an institutional sustainability perspective. The results have implications for understanding the relationships of sustainability knowledge, sustainability attitudes and institutional sustainability practices, to sustainable lifestyle behaviours. Overall, results suggest that whilst students generally have positive attitudes and knowledge about sustainability, institutional contexts are important in determining to what extent these behaviours consistently translate into sustainable actions.

5.1. SUSTAINABILITY KNOWLEDGE, ATTITUDES, AND THE INTENTION–BEHAVIOUR GAP

The study hypothesized a positive relationship between sustainability knowledge and sustainability attitudes, which was consistent with the Theory of Planned Behavior and findings from earlier research regarding sustainability. More comprehension regarding sustainability and environmental issues, as well as resource consumption behaviour so much appeared to develop a favourable attitude toward sustainable development. In support of this point, these results are constant with the assertion that Education for Sustainable Development is important in students development regarding their awareness of sustainability.

However, the results also highlighted an intention–behaviour gap. Students reported high levels of environmental attitude and concern, but sustainable lifestyle behaviours were less uniformly strong. This finding is in line with earlier research that shows that sustainability awareness and pro-environmental attitudes alone do not guarantee long-term behavioural change (Kollmuss & Agyeman, 2002).

The Theory of Planned Behaviour (TPB) may explain this gap in accordance to perceived behavioural control and contextual support. Some students might have favourable sustainability intentions, but then face pragmatic obstacles that lower their capacity to perform sustainable behaviours consistently. Thus, these results indicate that sustainability behaviour is best framed not as an individual psychological outcome, but rather as dependent on institutional and contextual conditions.

5.2. THE ROLE OF GREEN UNIVERSITIES AS ENABLING INSTITUTIONAL CONTEXTS

One key contribution of this study is to identify that green universities are one important institutional environment influencing sustainable lifestyle behaviours. Results showed that actual green campus practices, such as visible recycling systems, environment friendly infrastructure and operation plans/policies oriented to sustainability significantly predicted sustainable life style behaviors of students.

These insights are in-line with research that notes universities as “living laboratories” for sustainability organising (Purcell et al., 2019). When sustainability practices are integrated into campus operations and daily university life,

sustainable behaviours become easier to access, socially accepted, and convenient to perform. Therefore, green campus environments may not only promote students perceived behavioural control but also increase the social norms regarding sustainability.

It is these results that suggest universities should not be regarded merely as educational institutions, but instead also as behavioural ecosystems with the potential to affect the everyday decisions made by students. Institutional sustainability efforts may lower many practical barriers to sustainable behaviour and foster an environment that normalizes more environmentally friendly lifestyles in higher education contexts.

5.3. CURRICULUM INTEGRATION AND STUDENT ENGAGEMENT

Additionally, the results underlined the crucial role that curriculum integration and student engagement have in promoting sustainable lifestyle behaviour. Sustainability embedded across different subjects was positively related to sustainability attitudes and sustainable lifestyle behaviors. The implication of this finding is that consistent exposure to sustainability concepts over the students time at university bolsters an understanding of sustainability and leads students to apply behaviours learned in their everyday lives outside the classroom.

This corresponds with the key principles of Education for Sustainable Development, namely interdisciplinary learning combined with critical thinking and practical problem definition and solving activities (Tilbury, 2011). If sustainability is balanced to fit a variety of subjects, students may better relate it with their own lives and responsibilities they will take on after college.

Another key predictor of sustainable lifestyle behaviour was related to the involvement of students in activities associated with sustainability. The environmental projects, campus initiatives, workshops and community activities that students participated in offered experiential learning opportunities which shaped their sustainability-oriented identities and social norms. This helped these students to go from theories to hands-on experiences with sustainability principles.

According to the TPB, student activities with fellow peers in groups may affect subjective norms because such activities create environments where sustainable behaviour is reinforced. This active engagement in the learning process would also improve perceived behavioural control by enhancing students confidence in their ability to carry out activities associated with sustainability.

5.4. INSTITUTIONAL BARRIERS AND STRUCTURAL CONSTRAINTS

The qualitative results identified a number of structural and institutional obstacles that limited students sustainable behavior. Major barriers mentioned by respondents were: lack of sustainability infrastructure, fragmented curriculum implementation, historical time restraints, perceived inconvenience to making changes (low inclination), and low awareness of institutional sustainability initiatives.

These results indicate that institutional sustainability may serve an often symbolic and compartmentalized role rather than aligning fully with university culture and operations. However, the impact of such initiatives on students' everyday behavioural practices is limited without consistent institutional support and effective communication.

These results therefore highlight the role of institutional coherence in sustainability. It is time for universities to integrate sustainability into an institutional strategy that links curriculum, campus operations, student engagement and organizational culture. Integration is required in order to create conducive environments that can facilitate long lasting sustainable behaviour change.

5.5. IMPLICATIONS FOR THEORY AND HIGHER EDUCATION PRACTICE

This study theoretically contributes to the sustainability behaviour literature by extending TPB with institutional sustainable factors. Although TPB primarily investigates individual-level determinants of behaviour, the results show that institutional environments have a notable impact on students' perceived behavioural control and sustainability-related social norms. This suggest that greater attention to contextual and institutional dimensions may be beneficial in sustainability behaviour models, especially in educational contexts.

From the practical perspective, the findings offer a few significant implications for higher education institutions that desire to contribute more towards achieving Sustainable Development Goals. Green Campus Infrastructure The first step

of any plan should involve infrastructure that is visible, such as recycling containers, energy-efficient systems and systems of transportation.proxy[See Also: Environmental Issues in the International/Global Public Relations context] Not only does such infrastructure lessen the environmental footprint, it also helps to provide nurturing environmental conditions for sustainable behaviour.

Also, they should integrate sustainability more systematically in academic curricula rather than confining sustainability education to single courses or fields. Enrichment of student engagement opportunities also calls for sustainability-oriented project-based learning and campus sustainability initiatives to strengthen experiential learning and behavioural application.

In general, the results highlight that higher education is an important driver of sustainable lifestyles and significant progress could be made towards SDG 4, SDG 12 and SDG 13 if comprehensive institutional sustainability strategies were in place.

6. THEORETICAL AND PRACTICAL IMPLICATIONS

6.1. THEORETICAL IMPLICATIONS

This research complements the literature on sustainability in higher education by extending the Theory of Planned Behaviour (TPB) with additional university-level factors associated with institutional sustainability. Although TPB based research is often limited to individual level pro-environmental behaviour, the results of this study show that institutional conditions play an important role in the mechanism from sustainability attitudes to sustainable lifestyle behaviours.

Green campus practices lead to perceived behavioural control and social norms about sustainability and impact the integration of sustainability in curriculum, student engagement opportunities. It seems that institutional factors alleviate structural barriers to sustainable behavior while enhancing sustainability-oriented cultural norms in universities. Thus, the results indicate that sustainable lifestyle behaviour can not be sufficiently explained by individual attitudes – institutional context should also be addressed as a relevant behavioural determinant (Kollmuss & Agyeman 2002).

This research offers a new conceptual framework of how sustainability attitudes transfer into behavioural outcomes in higher education settings by combining TPB with an institutional sustainability lens. These results therefore lend weight to the case for integrating an organisational and environmental dimension within sustainability behaviour models, especially in educational settings where social norms and structural conditions exert substantial influences on behaviour.

Moreover, the research provides empirical evidence for a Southeast Asian context where studies investigating green university behaviour-related efforts so far remain somewhat scarce. Most previous studies were either limited to Western higher education institutions or institutional sustainability rankings rather than students everyday sustainability practices. By providing insight into sustainability behaviour within all post-secondary institutions across Canada, this research serves to broaden the scope of previous studies that were limited in geographical and contextual differences.

6.2. PRACTICAL AND POLICY IMPLICATIONS

The results of this study have several practical implications for higher education institutions and policymakers to promote sustainable lifestyles benefiting SDGs.

First, University need to emphasize the visible and easy green campus infrastructure. Providing recycling system, energy-efficient buildings with outdoor spaces conducive for sustainable transportation as well as green campus spaces may serve to positively impact students' sustainability lifestyle behaviours. But visible sustainability infrastructure also reaffirms the idea that sustainability is believed at an institutional level, not just in academic parlance.

Then, sustainability needs to be woven into curricula at the university level in a systematic fashion rather than being confined to specialized environmental courses. This will imbue students with a deeper appreciation and understanding of the natural systems that sustain life, expand their critical thinking capabilities and assist them to engage in sustainable practices. Interdisciplinary curriculum integration might also help students to connect principles of sustainability with the ordinary lives they would be leading and the professional roles they would play in future.

Third, universities should broaden opportunities for student involvement in sustainability. One way to reduce the hands-free component and increase experiential learning is to participate in environmental projects, campus sustainability programs, workshops, or community partnerships that motivate students to engage with sustainability concepts more directly. Such activity may also strengthen students' responsibility and sustainability-oriented identities.

At the policy level, national higher education ministries and educational policymakers should encourage institutions to expand and develop sustainability frameworks that unify curriculum, campus operation, governance and student involvement. Various protocols have been put in place to ensure that sustainability policies transition from mere professed commitments to environmental sustainability towards establishing institutional settings which would backdrop and bolster sustainable conduct behaviours.

The results also imply that universities can be leverage point enabling the attainment of SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production) as well as SDG 13 (Climate Action). Most importantly, through holistic sustainability initiatives, the higher education sector can not only raise awareness about environmental issues but also help to facilitate lasting change in behaviours of future graduates.

The conclusive aspect of the study discourses making the assumption that sustainable higher education is not only about infrastructural improvements but an organisational process where several factors such as education, infrastructure, institutional culture and student participations together play a key role in developing sustainable lifestyles.

7. ORIGINALITY AND CONTRIBUTION TO KNOWLEDGE

This study offers a number of new insights into higher education sustainability and green university research.

Second, this study adds empirical evidence from a Southeast Asian context (i.e., Thailand), as research investigating the nexus of green universities and students sustainable lifestyle behaviours is still limited. Previous research has primarily centred on sustainability efforts in Western higher education or mainly covered institutional rankings or environmental management systems for sustainable development. This study contributes to the sustainability implementation in non-Western higher education context by examining students' sustainability knowledge, attitudes, and lifestyle behaviours in relation to Thai universities.

Second, this study contributes to the literature by explaining how and why institutional sustainability practices will affect behaviour. Much of the earlier work has focused on sustainability policies, green infrastructures in campus buildings or institutional performance measures, but paid less attention to how such institutional level initiatives play out at the everyday behaviours of students. This research goes beyond the descriptive analysis of institutions by providing an empirical exploration of sustainability knowledge, sustainability attitudes, institutional sustainability practices and sustainable lifestyle behaviours.

Finally, from a theoretical perspective, the study offers both an integration of the Theory of Planned Behaviour (TPB) and institutional sustainability. While TPB has been extensively used to explain individual level pro-environmental behaviour, this study provides evidence that institutional conditions like green campus initiatives, curriculum integration and student engagement opportunities significantly impact sustainable behavioural outcomes. Discovering that institutional context is crucial to reducing the intention-behaviour gap in higher education settings thus extends TPB.

Fourth, it reinforces the idea that universities need to think of themselves more as behavioural and cultural environments than simply degree-producing organisations. The results imply that green universities can act as "living laboratories" where sustainability materializes through routine campus practices, institutional culture and social interaction. Such perspective has led to an increasing conversation about the transformative nature of Higher-Education Institutions (HEIs) with respect to the Sustainable Development Goals (SDGs).

Lastly, the article shares actionable knowledge that could help university and policy makers to formulate more effective sustainability strategies. Results, suggest that for sustainability initiatives to impact students lifestyles they should be coordinated and visible efforts inclusive of institutional infrastructure, curriculum integration and student participation. This adds value to higher education institutions as they work towards integrating their role in the wider support for sustainable development and sustainable lifestyles.

In sum, this study adds to both theoretical and empirical understandings of green universities in relation to student lifestyles and their contribution to the sustainability agenda via higher education.

8. LIMITATIONS AND FUTURE RESEARCH

This study has some limitations that need to be mentioned despite its contributions.

First, the study included a comparably small sample consisting of 100 undergraduate and postgraduate students. While the sample provided some useful exploratory information into sustainability knowledge, attitudes, institutional practices and sustainable lifestyle behaviours within Thai higher education institutions, these characteristics of the WGS cohort in this study limit its generalisability due to being a small sample size. Future research should include larger and more diverse samples in multiple institutions to enhance external validity, improve representativeness of results.

Second, the research was based on predominantly self-reported questionnaire data. Response bias can influence self-reported measures, such as social desirability bias, where participants could exaggerate environment-friendly attitudes or behaviours. Thus, the sustainable lifestyle behaviours reported are probably not translated one-to-one into behavioural practices. If the outcome of interest is behaviour change, future studies could cross-reference these methods with a more objective collection of sustainable behaviour measures, such as behavioural observation or institution-supported sustainability audits or longitudinal tracking.

Third, due to limited cross-sectional study design, it is not possible to control for establishment of casual relationships among the dimensions of sustainability knowledge, attitude, institutional they were associated with each other and sustainable lifestyle behaviours. While these findings highlight relationships among these variables, cause cannot be determined from the results. More longitudinal or experimental research may illuminate the processes by which attitudes and behaviours change over time with respect to sustainability in university settings.

Fourth -- the paper was designed mainly based on expectations of students, in some selected universities (in Thailand): especially for Shinawatra university, with perspectives from Chulanlongkorn University and Kasetsart University. Hence, the results cannot be generalized to all higher education institutions in Thailand or elsewhere in different cultural and geographical contexts. Future comparative research between universities from distinct cultural, institutional and policy settings would be informative of how local contexts shape sustainability behaviour.

Should this come to a conclusion, the research designs simple statistics such as descriptive analysis, correlation analysis and multiple regressions respectively. Future research can use superior analytical methods like Structural Equation Modeling (SEM) to analyse the more complex relationships between institutions sustainability practices, psychological factors, and behavioural outcomes.

Moreover, future studies may include other significant covariates causing sustainable lifestyle behaviours such as environmental identity, social influence, leadership support for sustainability education and socio-economic variables. Exploring these domains might add to a deeper understanding of sustainability behaviour in higher education contexts.

Despite these boundaries, the present study provides valuable preliminary evidence of a relationship between green universities and sustainability lifestyles, as well as laying academic groundwork for future work with sustainability behaviour in higher education.

9. CONCLUSION

This study aimed to explore the green university concept, as a context for sustainable lifestyle behaviours among students within Thai higher education institutions using the theory-driven mixed-methods approach. This study combines the Theory of Planned Behavior (TPB) and institutional sustainability perspective to examine the links between sustainability knowledge, sustainability attitudes, institutional sustainability practices, curriculum integration, student engagement and sustainable lifestyle behaviours respectively.

The results indicated relatively moderate to high levels of Sustainable Knowledge and positive Sustainability Attitudes. In contrast, albeit high, stable levels of sustainable lifestyle behaviours suggest an intention-behaviour gap. Despite students' strong environmental attitudes and support for sustainability, positive attitudes failed to translate into routine sustainable behaviour due to institutional and contextual constraints.

The latent class analysis in the study confirmed institutional sustainability factors were strong predictors of sustainable lifestyle behaviours, particularly visible green campus practices, integration of environment/sustainability content into curriculum and student opportunities for engagement with sustainability focused practices. Universities that provided accessible sustainability infrastructure or that incorporated sustainability concepts into academic curricula, and universities where students were given the opportunity to participate in actively working toward sustainable behaviours were more effective at helping support students to engage with sustainable behaviours.

These results underline how higher education institutions function as enabling environments to achieve sustainability-oriented behavioural change. The Green University is both an education and research centre, as well forming a core space where sustainability values, norms and practices become deeply rooted throughout the daily experiences. Universities could support the normalization of sustainable lifestyles among students and close the intention-behaviour gap by creating supportive institutional conditions.

Theoretically, this research extends the Theory of Planned Behavior to include institutional sustainability aspects. Conclusion The study findings show that sustainable lifestyle behaviour is to be taken into account in higher education contexts as both a psychographic-driven process based on (perceived) attitudes, help individualistic-oriented intentions shaped by institutional structures and contextual environmental conditions.

On a practical level, the study stresses that universities need to take an interconnected and holistic approach to sustainability policies. Sustainability initiatives should be less on the symbolic carbon commitments to the environment and more about systematically aligning curriculum, campus operations, institutional culture, and student engagement. Such integrated approaches may also enhance the role of higher education institutions to contribute towards achieving SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production) and SDG 13 Climate Action.

Overall this study supports and extending the increasingly recognised power for universities to become effective agents of sustainable development, by educating future generations on sustainability knowledge, attitudes and behaviours. Institutional dedication to continuous sustainability education and green campus initiatives is likely to have a major role in the long term social and environmental change both in Thailand and internationally.

10. ETHICS STATEMENT

This study complied with ethical standards for social science research on human subjects. Participation was voluntary and respondents gave a written informed consent before administrating the questionnaires. Individual data were not stored, and all answers were rendered anonymous in order to guarantee the participants' anonymity. No intervention was included in the study and no sensitive personal data were collected.

11. AI USE DECLARATION

The authors appreciate the minimal use of artificial intelligence resources in the simple language refine, clear, and formatting for this manuscript. Every part of the research process—from development of the concept, to study design, data collection, analysis and interpretation of data, was done by authors independently. Full responsibility for the originality, accuracy and integrity of submitted manuscript rests with the author(s).

12. DATA AVAILABILITY STATEMENT

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request. Because of ethical restrictions and confidentiality of subjects, these data are not available publicly.

CONFLICT OF INTERESTS

None.

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