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CONCEPTUAL FRAMEWORKS OF SUSTAINABLE CAMPUS INITIATIVES FOR MALAYSIAN HIGHER EDUCATION INSTITUTIONS

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Abstract — Higher education institutions play a significant role in promoting sustainability, both through the way they operate and through educating the next generation. However, in line with the Sustainable Development Goals by the United Nations, it remains extremely challenging for Malaysian higher education institutions to fulfil these requirements, as there is no specific conceptual framework developed to guide sustainable campus efforts effectively. To address this gap, this study develops a comprehensive conceptual framework for sustainable campus initiatives that is applicable to the Malaysian context. Using a systematic literature review, 949 articles were reviewed from the Scopus and Web of Science databases between 2015 and 2025. After screening based on inclusion, exclusion, and quality criteria, 35 relevant papers were eligible for full review. Based on the results, six elements were identified for the development of the conceptual framework. The six elements for the success of sustainable campus initiatives are (1) government and leadership, (2) strategic planning, (3) operations, (4) curriculum development, (5) research and development, and (6) community engagement. The findings suggest that these key elements are critical to the success of sustainable campus efforts. This conceptual framework offers Malaysian higher education institutions a systematic and actionable approach to improve their sustainability practices and achieve their societal goals towards the global SDG agenda.

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***Keywords*:** conceptual framework, higher education institution, initiative, sustainable campus

1.0 INTRODUCTION

Today, sustainable development is no longer a choice but a global necessity in response to the United Nations' Agenda with its 17 Sustainable Development Goals (SDGs) [1]. In this context, Higher Education Institutions (HEIs) are responsible not only as knowledge hubs but also as living laboratories for sustainability. The unique role of HEIs in educating future leaders and pioneering research positions brings the transformation towards a sustainable future [2]. This has reshaped the commitments of HEIs towards sustainability by embedding sustainability principles into their institutional mission and vision [3]. The integrating sustainability into their institutional operations can significantly reduce their environmental impact and transform campuses into living laboratories for sustainable practices [4]. This transformation not only provides practical sustainability solutions but also promotes a culture of sustainability among students, staff and the wider campus community [5].

However, despite these growing commitments, there remains a significant gap between Sustainable Campus Initiatives (SCIs) and their implementation. Globally, many HEIs struggle to implement sustainability in a holistic manner, often focusing on initiatives such as energy efficiency, recycling activities and waste reduction efforts [6]. While these initiatives demonstrate institutional awareness of environmental responsibility, these are frequently implemented as standalone activities rather than as part of an integrated sustainability strategy. As a result, their contributions towards achieving the broader SDG agenda remain limited [7], due to the absence of a comprehensive and integrated conceptual framework to guide SCI implementation. Without this framework, SCIs risk being

fragmented, poorly coordinated, and misaligned with institutional sustainability goals, ultimately limiting their effectiveness in supporting SDG achievement [8].

In recent years, Malaysia has demonstrated an increasing commitment to sustainability through national policies and strategic initiatives. The Malaysian government has introduced sustainable policies such as the National Green Technology Policy and the Malaysia Education Blueprint, which encourage HEIs to implement green practices [9]. Additionally, the Ministry of Higher Education has actively promoted the integration of the SDGs into university agendas. Despite these efforts, the implementation of SCIs across Malaysian HEIs remains inconsistent [10]. Many institutions tend to focus primarily on operational sustainability initiatives such as waste management, energy efficiency, and water efficiency, while other critical dimensions, including leadership commitment, curriculum integration, research, and community engagement, remain insufficiently addressed [11].

This imbalance highlights a key structural challenge in SCIs implementation. Current sustainability efforts within HEIs are often implemented independently, with individual initiatives being implemented without a coherent institutional strategy that links governance, academic functions, campus operations, and community involvement. As a result, sustainability initiatives fail to generate systemic impact across the university ecosystem. These gaps clearly show that policy directives alone are insufficient to ensure effective sustainability implementation without a clear and contextualised conceptual model that integrates multiple institutional dimensions. Therefore, this research seeks to address this critical gap by developing a comprehensive conceptual framework for SCIs tailored to the context of Malaysian HEIs. The objective of this study is not only to identify but also to synthesise the key elements of an effective SCIs framework and to explain how these elements interact to support a more coordinated and holistic implementation of sustainability within HEIs.

2.0 LITERATURE REVIEW

The concept of a sustainable campus in Malaysia has changed significantly from a narrow focus on environmental management to a more holistic understanding. The sustainable frameworks are often associated with "green" or "eco-campus" initiatives, which focus on environmental dimensions such as energy efficiency, waste management, and conservation [12, 18]. For example, a study conducted by Saleh and Abdullah [13] revealed that Universiti Pendidikan Sultan Idris (UPSI) focused on the environment with efforts directed towards greening the physical campus. Similarly, an initiative at Universiti Putra Malaysia (UPM) known as "Green@UPM" showed their efforts to cultivate ecological practices [8]. This environmental dimension has been progressively implemented, while other sustainable dimensions, such as social, economic, and governance aspects, have been neglected. While the old green campus concept prioritised only ecological concerns, a new sustainable campus integrates environmental, social, economic, and governance aspects [14]. The evolution of a sustainable campus from the green campus paradigm is necessary to cover all sustainable dimensions in line with the SDGs' agenda [15]. In recent studies, for instance, the need for a framework, as stressed by Anthony [16], should link to the SDGs' agenda and emphasise the importance of HEIs contributing to all 17 goals.

In Malaysia, many studies have focused on creating tools to evaluate campus sustainability. These tools are used for benchmarking performance and tracking progress, enabling HEIs to assess their level of implementation in achieving the SDGs. Therefore, this perspective can be seen as one of the earlier stages for HEIs to continuously improve their sustainable campus efforts [17]. Similarly, the value of early-stage efforts with clear direction in fulfilling sustainability agendas [18]. Previous studies have also focused on specific indicators to establish sustainable development within Malaysian HEIs. For example, one study developed a sustainable education indicator aimed at measuring and evaluating the green campus, with a focus on operational aspects [19]. In addition, a framework was proposed by Lee [20] that provides a structured checklist for evaluation. The framework can be categorised into several key areas such as energy, waste, water, and transportation. However, there are still limited insights into how these elements can drive the successful implementation of sustainability.

The frameworks could have incorporated governance aspects into sustainable campus initiatives [21]. For example, the ECO-Campus model explained well how operations, regulations, and the availability of resources can influence environmental benefits in Malaysian HEIs. Governance is one of the critical enabling factors for sustainability, especially within HEIs. A study conducted at Universiti Sains Malaysia (USM) highlighted how institutional dimensions, such as implementing sustainable policies and guidelines, as well as having strong leadership to guide and enable campus initiatives, are crucial in shaping successful sustainable practices [22]. This finding is supported by Junior et al., [15], who theorised that effective green campus governance, encompassing leadership, stakeholder

engagement, and participation, is essential in promoting sustainability in HEIs. A framework is proposed by Nifa et al., [23] to fully integrate economic, environmental, social, and governance aspects within Malaysian HEIs. This suggestion is more comprehensive and positions governance not as a separate pillar but as the foundational system that helps integrate economic, environmental, and social dimensions for more holistic and actionable SDGs. However, a gap in implementation remains, where critical success factors persist. Research by Saleh and Abdullah [13] identified several Critical Success Factors (CSFs) within the Malaysian context, in which the CSFs were the commitment of top management, financial issues, and a lack of technical expertise. In addition, community engagement, such as the involvement of students and staff in sustainable initiatives, was also considered one of the CSFs [24, 25]. The engagement and commitment of the campus community are vital for the success of a sustainable campus, as maintained by Nawanira et al., [25].

Furthermore, the need for more actionable implementation roadmaps for HEIs is highlighted by Peter et al., [26] due to the disconnect between sustainable strategies and their practical implementation. One of the key challenges is that initiatives are often fragmented and not integrated into the core academic and operational aspects of HEIs [27]. Inconsistency also persists in the integration of sustainability into curricula even though Malaysian HEIs are increasingly engaging with Education for Sustainable Development (ESD) [19]. As agreed upon in the study of Asadi et al., [27], varying levels of ESD integration exist within the Malaysian education sector. A practical barriers in achieving a zero-waste campus, where infrastructural, behavioural, and policy barriers exist [28]. These challenges underscore the need to have a conceptual framework that is not only theoretically sound but also practical in addressing the real-world difficulties of implementation.

3.0 METHODOLOGY

A systematic literature review was employed in this study to synthesise existing knowledge and develop a conceptual framework for SCIs applicable to Malaysian HEIs. This research method is well-established for synthesising scientific knowledge to develop theoretical models [29]. Hence, several strategies and stages were developed to identify relevant previous research on conceptual frameworks and the implementation of sustainable initiatives within HEIs globally that can be applied to Malaysian HEIs. To achieve the objective of this study, a structured search strategy was conducted using two major international databases, namely Scopus and Web of Science (WoS). These databases were selected because they index high-quality peer-reviewed journals and provide broad global coverage of sustainability and higher education research. Local databases like MyCite were not included in the initial search because the purpose of this review was to identify widely recognised conceptual frameworks and theoretical elements of SCIs developed in global literature. The Malaysian context was subsequently incorporated during the framework development stage, where the synthesised elements were interpreted and adapted to the Malaysian HEI environment. This approach ensured that the proposed framework is theoretically grounded while remaining contextually relevant to Malaysia. In addition, the keyword “Malaysia” was intentionally not included as a primary search term in the query. The aim of the review was not limited to identifying Malaysian case studies but rather to capture a broader body of conceptual and theoretical work on sustainable campus initiatives globally. This broader search strategy allowed the study to identify transferable sustainability elements that can be synthesized and adapted to address the implementation challenges faced by Malaysian HEIs. The primary search query used was:

> [TITLE-ABS-KEY (sustainable) AND TITLE-ABS-KEY (campus) AND TITLE-ABS-KEY (initiatives)] AND TITLE-ABS-KEY (framework OR model) AND TITLE-ABS-KEY (higher education)

The selected publications were limited to the period between 2015 and 2025 to ensure the inclusion of recent and relevant sustainability research. This broad initial search aimed to identify foundational studies on sustainability frameworks and campus initiatives, which were subsequently analysed to identify recurring elements and conceptual relationships applicable to the Malaysian HEI context.

The systematic review process was categorised into three stages named (i) the identification process, (ii) the screening process, and (iii) the selection process, as detailed in Figure 1. In the first stage, the identification process, a thorough search was performed across the two selected databases.

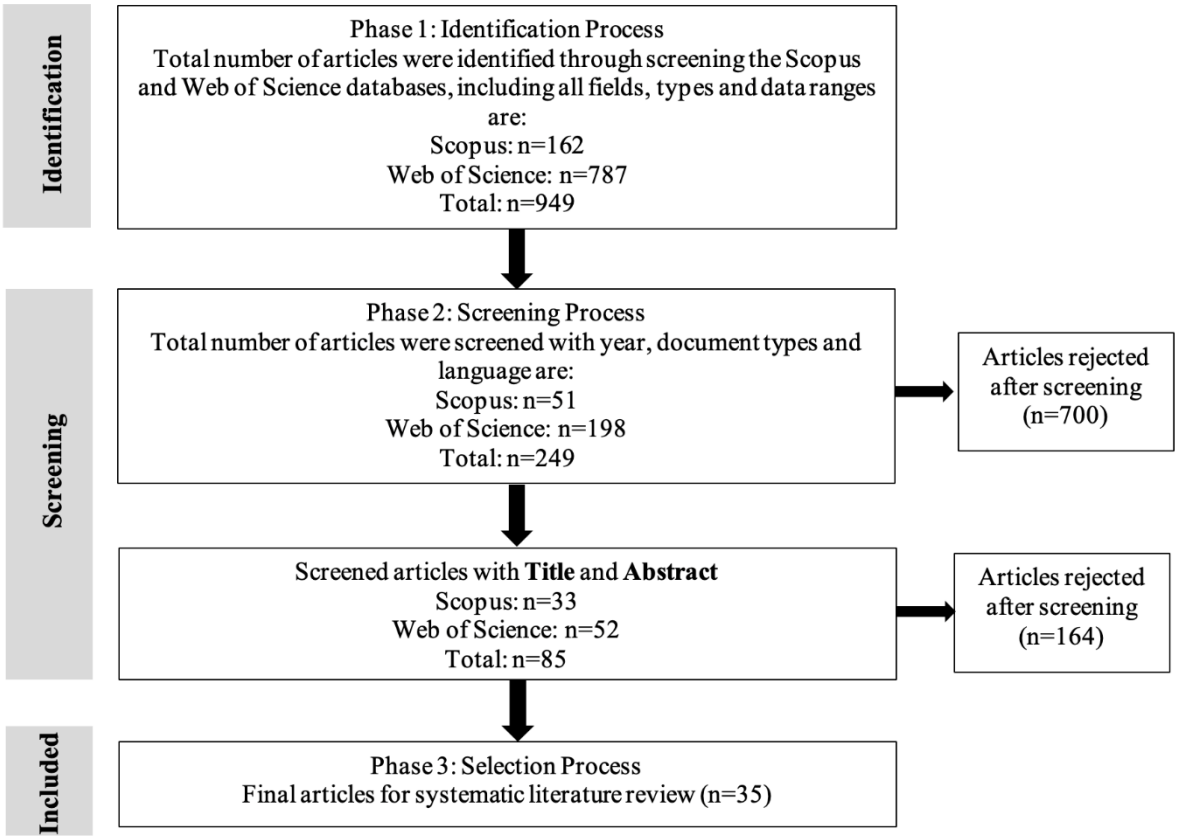


Figure 1 Process selection of articles for systematic review

By using the defined search query, sustainable AND campus AND initiative AND (framework OR model) AND (higher AND education), a total of 949 articles were identified (Scopus: n=162; Web of Science: n=787).

During the second stage, the screening process, eligibility criteria were applied based on publication year (2015 to 2025), document type, and language. As a result, 249 articles were included after the screening process (Scopus: n=51; Web of Science: n=198), while 700 records were excluded. Then, after reviewing the relevant titles and abstracts, 85 articles were selected (Scopus: n=33; Web of Science: n=52), resulting in the exclusion of 164 non-relevant articles. In the final eligibility stage, these 85 articles were thoroughly assessed for relevance. Finally, 35 articles directly related to the development of the conceptual framework of sustainable campus initiatives were selected for this study. The remaining 50 articles were excluded due to their lack of direct focus on the conceptual or key elements of sustainable campus initiatives.

The extracted information was organised into structured tables in Microsoft Excel to facilitate systematic comparison across studies. The matrix mapped each study against six key sustainable campus elements identified from the literature, including community, curriculum, governance, operations, research, and strategic initiatives. Each article was coded according to the presence of these elements, enabling a systematic comparison of thematic coverage across studies.

This synthesis matrix served as the primary analytical tool for identifying patterns, recurring themes, and gaps within the literature. Through iterative comparison across the matrix, the research team was able to determine the relative emphasis of each sustainability element and its relationship to campus sustainability implementation.

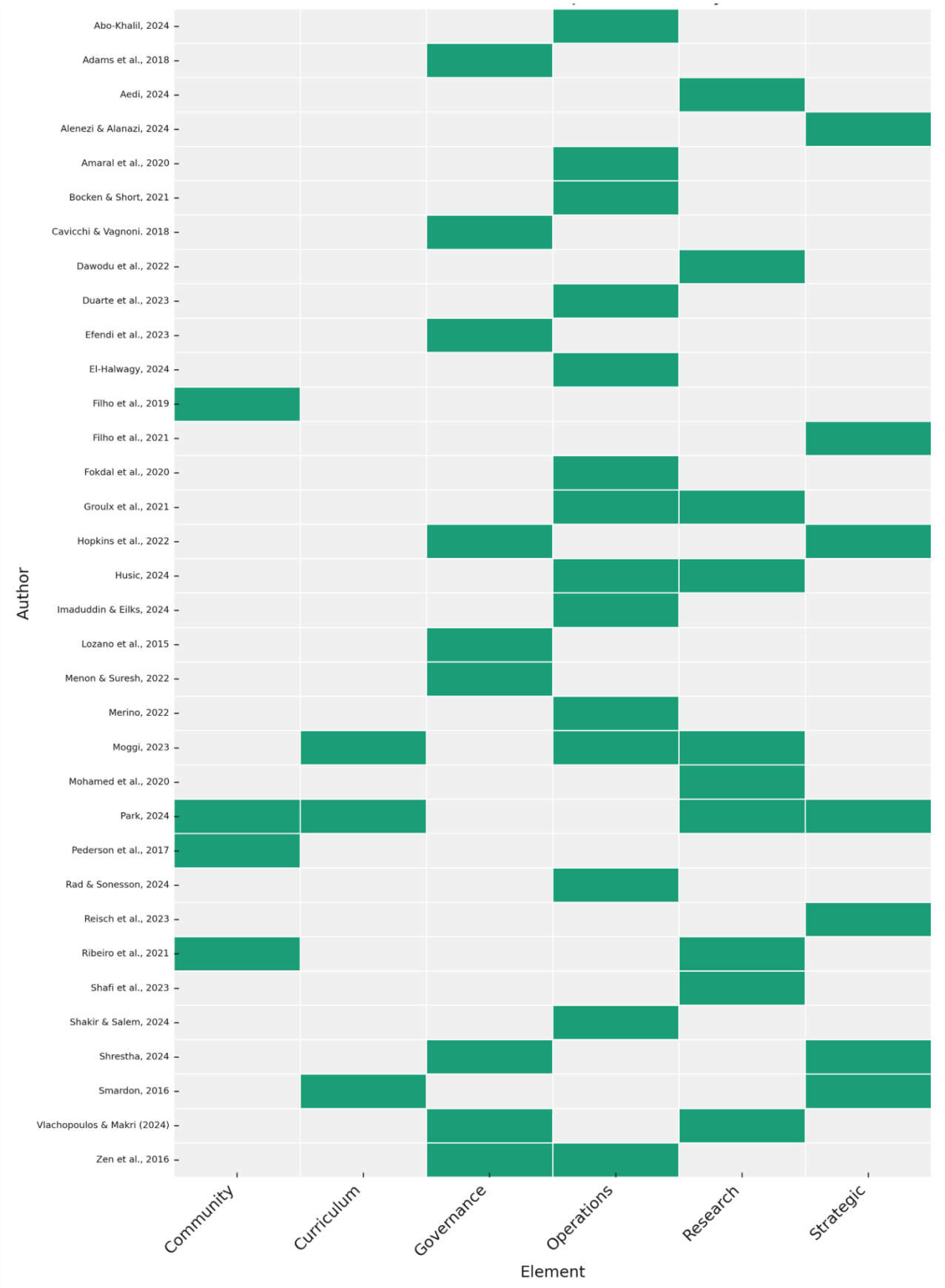


Figure 2 Pilot tile of sustainable campus based on the elements from previous studies

To further enhance transparency and provide a visual representation of the thematic synthesis, the matrix was subsequently visualised using a tile plot (Figure 2). The tile plot displays the distribution of sustainability elements across the 35 reviewed studies, where highlighted cells indicate the presence of a particular element in each study.

This visual synthesis supports the identification of dominant themes and under-represented areas within literature. The results from the thematic matrix and visual synthesis were then integrated across studies to support the development of the conceptual framework. This synthesis process enabled the identification of core sustainability components and their interrelationships, which form the basis for the proposed framework for sustainable campus initiatives in Malaysian HEIs.

4.0 RESULT AND DISCUSSIONS

4.1 Identification of Independent Variables (IV) and Dependent Variables (DV) for Sustainable Campus Initiatives

The results of the systematic literature review are presented in Figure 3 to develop a conceptual framework for SCIs, which consists of independent and dependent variables. Based on the data extraction, six key elements are found that directly influence the success of SCIs in Malaysian HEIs. These six key elements are classified as (1) government and leadership, (2) strategic planning, (3) campus operations, (4) curriculum development, (5) research and development, and (6) community engagement. In this study, the dependent variable is operationally defined as the level of implementation and institutional integration of sustainability practices across campus systems. Rather than representing individual initiatives themselves, sustainable campus implementation reflects the extent to which sustainability principles are embedded within institutional governance, teaching, operations, research activities, and community partnerships. This operational definition avoids conceptual overlap between the dependent variable and the six elements, positioning them as institutional drivers that collectively influence the successful implementation of sustainable campus systems. All six elements collectively address the three pillars of sustainability, which are economic, social, and environmental dimensions, that align with SDGs. The synthesis of the 35 reviewed studies (Figure 2) further demonstrates the distribution of these elements across the literature, indicating that governance, operations, and research are the most frequently emphasised dimensions in sustainable campus studies.

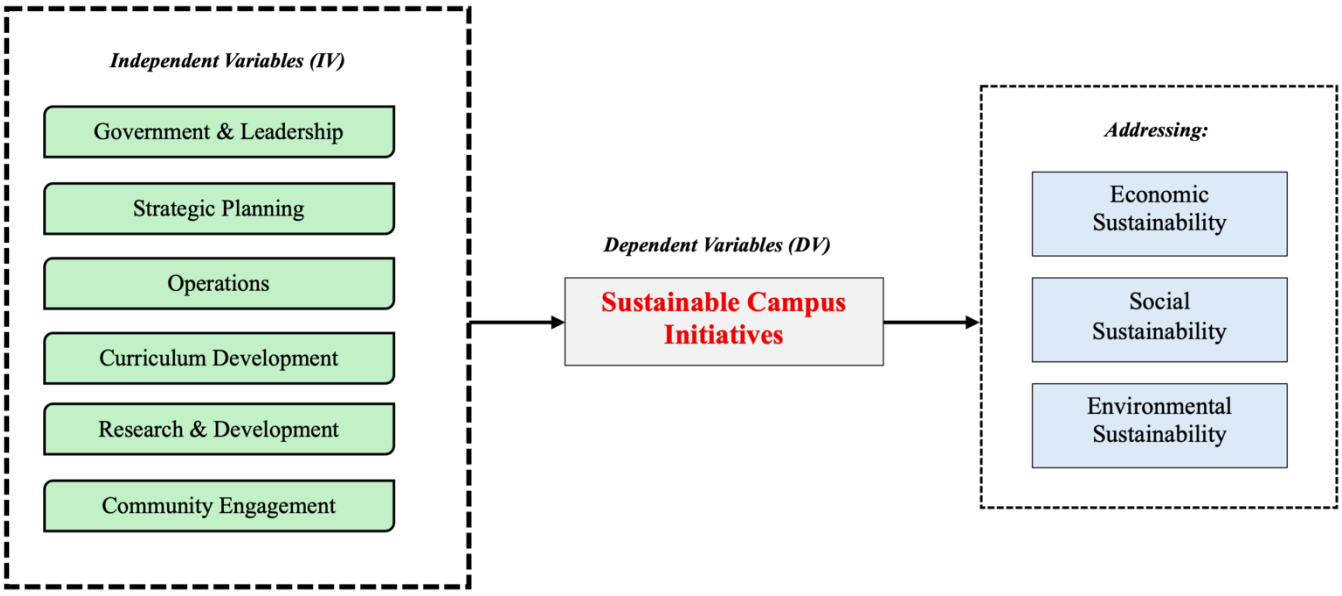


Figure 3 Conceptual framework for sustainable campus initiatives

4.1.1. Governance and leadership

The first element classified in the conceptual framework for SCIs is governance and leadership. In the context of HEIs, governance refers to internal institutional structures, policies, leadership commitment, and decision-making mechanisms that guide sustainability integration. Previous studies by Efendi et al., [30] and Shrestha [31] highlighted that institutional leaders play a critical role in advocating sustainability agendas that integrate environmental, economic, and social dimensions. Leaders are responsible for establishing institutional policies, allocating resources, and embedding sustainability into long-term institutional strategies. Within the Malaysian higher education context, governance plays a particularly important role due to the centralised management structure of many public universities. Institutional leadership is therefore essential for translating national sustainability agendas into campus-level policies and operational strategies. Furthermore, HEIs were suggested to

integrate SDGs into institutional governance structures to align campus sustainability efforts with global sustainability frameworks [32]. This governance mechanism acts as a catalyst for other sustainability elements, particularly strategic planning and campus operations, by enabling institutional support, funding allocation, and policy direction.

4.1.2. Strategic planning

Strategic planning is the second element, offering an essential blueprint and action plan for the implementation of sustainability into institutional strategies and curricula. Strategic planning involves integrating sustainability principles into institutional vision, mission statements, policies, roadmaps, and long-term development plans. Studies by Reisch et al., [33] emphasised that strategic mapping, which links SDGs to institutional action plans, helps to coordinate sustainability initiatives across campus units. Strategic planning also serves as the operational bridge between governance commitment and implementation activities. For Malaysian HEIs, strategic planning is particularly important because sustainability initiatives often require coordination between academic faculties, administrative departments, and external stakeholders. Without clear institutional roadmaps, sustainability initiatives tend to remain fragmented or project-based rather than institutionally embedded. Thus, aligning governance structures with strategic planning ensures that sustainability initiatives are systematically integrated into institutional development plans rather than implemented as isolated projects.

4.1.3. Campus operations

The third element identified for SCIs is campus operations. The commitment to sustainability is translated into action through campus operations. Campus operations aim to reduce environmental impacts and ecological footprints by improving efficiency in the use of water and energy. Several aspects of campus sustainability that can be implemented, ranging from energy and water use to waste management as well as sustainable transportation [34]. In addition, there are eight key areas for sustainable campus operation initiatives, such as (1) energy, (2) buildings, (3) waste, (4) water, (5) transportation, (6) grounds, (7) air quality and (8) food. These eight operational areas are particularly relevant for Malaysian HEIs due to the country's tropical climate, growing campus populations, and increasing resource consumption [35]. For instance, energy management and green buildings are critical priorities because universities operate large facilities with high electricity demand for cooling systems. Waste management and food systems are also significant concerns due to the high volume of campus-generated waste and food consumption among student populations. Examples of campus initiatives include renewable energy installations, green building retrofits, recycling programmes, sustainable mobility initiatives such as e-bike programmes, and circular waste management systems [10]. These operational initiatives not only reduce environmental footprints but also serve as visible demonstrations of institutional commitment to sustainability.

4.1.4. Curriculum development

Curriculum development is the fourth element that advances sustainability knowledge for future generations. Strong institutional plans and leadership are essential for the successful implementation of sustainable curricula. Embedding sustainability within academic curricula [34, 35] to equip students with the knowledge, skills, and values necessary to address complex sustainability challenges. Courses related to environmental management, sustainable development, and climate change can enhance students' awareness and foster sustainability-orientated thinking. In Malaysian HEIs, curriculum integration remains an important mechanism for long-term sustainability transformation because universities play a key role in producing future professionals and decision-makers. Integrating sustainability across disciplines allows graduates to apply sustainability principles within diverse professional fields. Hands-on learning approaches such as project-based learning, field studies, and sustainability labs also allow students to actively participate in campus sustainability initiatives.

4.1.5. Research and development

The next element is research and development. The innovation of sustainability through knowledge creation and applied projects is typically demonstrated through research and development. The living laboratory approaches allow campuses to function as experimental environments where students and researchers collaborate on sustainability solutions [36]. These initiatives strengthen the integration between academic research and campus operations, allowing research outcomes to directly inform institutional sustainability practices. In addition, sustainability-related conferences, workshops, and collaborative research programmes provide platforms for

knowledge exchange and interdisciplinary engagement [37, 38]. Such activities help strengthen institutional sustainability networks and enhance research visibility. For Malaysian HEIs, research capacity in sustainability areas such as renewable energy, green technology, and environmental management is particularly important in supporting national sustainability agendas and policy development.

4.1.6. Community engagement

Lastly, community engagement completes the framework elements by highlighting partnerships with local groups and active student participation. A study by Efendi et al., [29] indicated that student participation in sustainability projects promotes a sense of ownership and encourages proactive environmental behaviour. Service-learning programmes and community-based projects enable students to apply sustainability knowledge in real-world contexts while addressing local environmental challenges. External collaboration also strengthens the societal impact of campus sustainability initiatives by promoting knowledge sharing and collective problem-solving. For Malaysian HEIs, community engagement is particularly significant, as because universities often serve as regional knowledge hubs that support local sustainability initiatives and community development programmes.

4.2. Implementation gap in Malaysian HEIs

Despite the increasing adoption of sustainability initiatives within higher education globally, an implementation gap remains evident within Malaysian HEIs. Analysis of the reviewed studies indicates that this gap is largely driven by several contextual factors, including limited institutional funding, fragmented governance structures, and varying levels of sustainability awareness among stakeholders. In many cases, sustainability initiatives are implemented at the project level rather than being fully integrated into institutional systems. As a result, initiatives such as green infrastructure or sustainability education often operate independently without strong coordination across governance, operations, and academic units. Addressing this implementation gap requires stronger governance commitment, integrated strategic planning, and increased investment in sustainability capacity building within HEIs.

In summary, the six elements identified in Figure 3 form an integrated framework for sustainable campus implementation in Malaysian HEIs. Rather than operating as independent pillars, these elements interact dynamically. Governance provides institutional leadership and policy direction. Strategic planning translates governance commitments into actionable roadmaps. Campus operations operationalise sustainability practices. Curriculum development educates future sustainability leaders. Research generates innovation. Community engagement extends sustainability impact beyond campus boundaries. These interconnected structures transform the framework from a static list of elements into a functional institutional model for sustainable campus transformation.

5.0 CONCLUSION

The existing literature provides a significant basis for understanding SCIs in Malaysia. The transformation evolves from a green campus to more integrative sustainable models that include governance and SDGs, marking a significant theoretical advancement. Sustainable frameworks that include economic, social, and environmental dimensions are essential for the success of SCIs. However, a gap in terms of implementation persists. The existing literature mostly focuses on assessment metrics, sustainable projects, critical success factors, and the impacts on the environment. There is a need for a comprehensive conceptual framework that integrates the key indicators of sustainable campus initiatives with implementation strategies to achieve the SDGs' agenda. Furthermore, while previous studies have focused on case-specific contexts, a framework that is adaptable to the diverse landscape of Malaysian HEIs is required. Hence, this research has addressed this gap by developing a comprehensive conceptual framework for SCIs that is applicable to the Malaysian HEIs context. This is aligned with the SDGs by providing a more actionable framework for driving SCIs in Malaysian HEIs.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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