The Role of Higher Education Institutions in Achieving SDG 11

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ABSTRACT

This study examines the role of Higher Education Institutions (HEIs) in advancing SDG 11, considering the size and population of HEIs as 'small cities' and as pivotal platforms for educating individuals across various levels. Integrating SDGs into Malaysian HEIs is still a relatively recent initiative, as the Ministry of Higher Education has not yet established specific guidelines. Accordingly, this research aims to investigate the efforts undertaken by Malaysian HEIs in achieving SDG 11 within their campuses. The study employed a comparative analysis of existing assessment tools used to evaluate sustainable HEIs. Subsequently, the semi-structured interview was conducted at six (6) public HEIs and the analysis was supported by ATLAS.ti software. The result revealed five main themes that shall impact SDG 11 in HEIs from the education perspective namely 1) Curriculum design, 2) research and innovation, 3) Campus setting and infrastructure, 4) Community engagement, and 5) Teaching. This research highlights that achieving SDG 11 can be realized through curriculum integration, research initiatives, campus design, community engagement, and teaching practices. These findings aim to inspire other HEIs in Malaysia to enhance their education systems and contribute further to the development of sustainable cities.

Keywords: sustainable higher education institutions, sustainable buildings, sustainable cities, sustainable development education

INTRODUCTION

Global sustainability issues such as climate change, deforestation, biodiversity loss and global warming have consistently been the primary concerns of countries in their development process [1]. Flash floods, extreme weather, and landslides happen regularly resulting in loss of property and human life. Buildings, the primary output of the construction industry, are significant contributors to energy consumption, Carbon dioxide (CO^2) emissions, and environmental pollution and destruction [2]. It was expected that two-thirds of the global population would live in cities by 2050, leading to the expansion of building construction. The global building area is expected to double by then, and the building energy demand will increase by 50%, which will go along with a continued rise in resource consumption and related gas emissions.

As a result, green building rating tools (GBRTs) have been introduced to evaluate the sustainability of buildings and reduce environmental impact as they are considered the most appropriate tool for measuring

building sustainability. Numerous GBRTs arose including Building Research Establishment Environmental Assessment Method (BREEAM), The Leadership in Energy and Environmental Design (LEED), the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE), and many more. GBI is the first GBRT tool developed in Malaysia by the Pertubuhan Arkitek Malaysia (PAM) in 2008 and the idea came from the Singapore Green Mark and the Australian Green Star System rating tools. It has been modified to suit Malaysian tropical weather, environmental and development context, and cultural and social needs [3]. Following its introduction, several other GBRTs have been established in Malaysia. Apart from GBRTs, the 2030 Agenda for Sustainable Development outlines 17 Sustainable Development Goals (SDGs), urging action from individuals and industries. These goals are comprehensive, addressing the three pillars of sustainability: economic, social, and environmental. One of the goals is to make cities and human settlements inclusive, safe, resilient and sustainable, which is SDG 11. In context of SDG 11 or sustainable city can be achieved through sustainable education, renewable energy, energy efficiency, sustainable transportation, sustainable buildings, waste management and many more [4]. This research emphasizes the development of sustainable cities through sustainable education, highlighting the significant contributions of HEIs.

Higher Education Institutions (HEIs) are increasingly crucial in advancing sustainability [5] since they are considered ‘small cities’ due to the large community and campuses [6], high level of social responsibility, and a crucial role in the development of social behaviors [7, 8]. Adopting sustainable practices in HEIs has been a longstanding global initiative since the 1990s. The aim of the research is to investigate the potential contribution of sustainable HEIs towards SDG 11. To achieve the aim, the research objective is as follows:

1. To examine the gap between existing GBRTs in evaluating sustainable HEIs in aspects of sustainability cities; and
2. Identifying and evaluating the important education components in developing sustainable HEIs in Malaysia

LITERATURE REVIEW

Sustainable Higher Education Institutions (HEIs) Vs Sustainable City

Education is an essential discipline in every country, and it is also a powerful driver of development and one of the most potent instruments not only for the development of sustainable cities but also for reducing poverty, improving health, gender equality, peace, stability, and many more. It is the right place where all the 17 SDGs can be achieved. For every individual, education promotes employment, earnings, living, health, and poverty reduction, while for society, it drives long-term economic growth, strengthens institutions, and fosters social cohesion. Numerous scholars have recognized HEIs as a prime channel for achieving Sustainable Development Goals (SDGs) through education [9]. In fact, many studies integrate SDG 4 into HEIs, and it is common. Meanwhile, HEIs that have similar characteristics that contribute to the development of sustainable city. The definitions and characteristics of a sustainable or green city vary, but they align with the broader concept of sustainability. The idea of sustainability originally comes from the 1987 Brundtland Report, which defines it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [10]. Building on this, the definition of a sustainable city, as outlined in the LCCF report, refers to a city where people want to live both now and in the future. It is a city that meets the diverse needs of its current and future populations, is environmentally conscious, ensures that its lifestyle and consumption patterns do not negatively impact the environment, preserves its natural ecology, and contributes to a high quality of life [11]. Several studies highlighted that a sustainable city must include three dimensions of sustainability: environment, society, and economy [12]. Cities and HEIs are considered similar in terms of size and population, but they differ in their primary focus. Sustainable HEIs should not only focus on environmental improvements but also address the sustainability of education itself. Many experts emphasize the importance of integrating sustainability into the curriculum, research, and teaching practices of HEIs.

Green Building Rating Tool (GBRT)

As the global environmental crisis arises, many countries have taken initiatives to develop green building rating tools (GBRTs). To date, it is estimated that more than 600 GBRTs have been developed [13]. The first establishment of GBRT was the Building Research Establishment Assessment Method (UK's BREEAM) in 1992 followed by Leadership in Energy and Environmental Design (US's LEED) in 1996 and both are popular and widely used GRBT [14].

The Malaysian government first introduced the concept of sustainable building through the Industrialized Building System (IBS). This transition impacted the development of the construction industry, and the concept of green building was then initiated in 2009 by the Green Building Index (GBI). The various GBRTs were established in Malaysia (Table 1) after the establishment of GBI.

METHOD

The research was conducted in two stages. The first stage was to identify the tools that can be used in evaluating sustainable HEIs in Malaysia by comparing existing GBRTs. Subsequently, the most suitable tools criteria were compared to identifying the research gap. Afterwards, a semi-structured interview was conducted at six selected public HEIs to investigate the elements or criteria of sustainable education embedded in HEIs in achieving SDG 11.

Selection of GBRTs

All existing Malaysian GBRTs were identify from the study from CIDB (2018), [11], [15], [16], [17], [18], and [19] to find the most suitable tools to evaluate sustainable HEIs. Malaysia has developed ten (10) tools for evaluating green or sustainable buildings. A brief of each GBRT is given below.

a. **Green Building Index (GBI)** - GBI has more than 18 evaluation categories of rating systems. The assessment result is divided into 4 categories: platinum, gold, silver, and certified. The categories are awarded based on the score given from each type of tool criteria. The initiation and development of the GBI tools allow developers and building owners to design and construct green and sustainable buildings that contribute to energy saving, water saving, healthier indoor environment, better connectivity to public transport, and the adoption of recycling and greenery for their projects and reduce the impact to the environment [20].
b. **Low Carbon Cities Framework and Assessment System (LCCF)** - The tool aims to assist the developers, local councils, town planners, non-governmental organizations (NGOs), and the public in reducing the level of carbon emission in cities towards achieving sustainable urban development. The focus area of LCCF is wider as it promotes sustainable cities by reducing the use of energy and the emission of CO2 including the use of green technology and green practices [11].
c. **Penilaian Penarafan Hijau JKR (pHJKR)** - The tool is one of the Malaysian government initiatives towards sustainable development. pHJKR aims to measure the sustainability of their construction project and to help the improvement of the existing buildings towards sustainable buildings. The targeted construction project is more focused on government projects and the tool is more suitable to be used for government projects [15].
d. **Melaka Green Seals** - It is the initiative of the Melaka State Government. Developed from the collaboration of Melaka Green Development Organisation (MGDO) and Perbadanan Teknologi Hijau Melaka in 2012 and established for residential and non-residential buildings, new and existing buildings. The establishment was based on the MS1525 Energy Efficiency Guide and Uniform Building by Law (UBBL) [16].
e. **Green Real Estate (GreenRE)** - It is developed 2013 to drive sustainability in Malaysia's real estate industry. Similar to GBI, GreenRE is also fully supported by the Malaysian government and local authorities. To date, GreenRE has produced up to 10 rating tools [21]. After GBI, GreenRE also show

great development of the GBRT tool, and these two tools are considered popular and are widely used to evaluate green buildings in Malaysia.

f. **The Malaysia Green Highway Index (MyGHI)** - The tool also developed by the Malaysian government specifically known as the Construction Industry Development Board (CIDB) which focuses on the development of sustainable highways [22] as the construction of roads and highways is among the major contributions towards the rise of carbon dioxide, deforestation, habitat loss, climate change and etc.
g. **CASBEE Iskandar** - The tool is developed in 2016 and used to evaluate a sustainable city specifically for Iskandar Malaysia (IM) (located in the Southern part of Peninsular Malaysia) [17].
h. **Malaysian Carbon Reduction and Environmental Sustainability Tools (MyCREST)** - This tool is also part of the government initiatives, produced to reduce the built environment's impact and created to evaluate air-conditioning and non-air-conditioning types of buildings. It is created through the integration of the members of government agencies, public as well as private institutions, corporations, and companies in Malaysia known as the Ministry of Works Malaysia (KKR), Malaysian Public Works Department (JKR), and Construction Industry Development Board Malaysia (CIDB). It is compulsory to follow MyCREST for the JKR projects that exceed RM50 million and above [18].
i. **Sustainable INFRASTAR** - This tool is also another initiative by the Malaysian government after the development of MyCREST. It was developed in 2019 and specifically designed to evaluate sustainable infrastructure development primarily at the design and construction stage [19].
j. **Green Performance Assessment System (Green PASS)** - Developed by the CIDB in 2021 and it is the latest tool developed. Focusing on buildings, it estimates the emission of carbon from building construction works throughout a building lifecycle without compromising on the desirable comfort of the building by assessing the indoor environmental quality.

Comparison of GBRTs

The development of GBRT in Malaysia has seen tremendous growth in the public and private sectors since 2015. The overview of all GBRTs is presented in Table 1. From the perspective of assessment applicability, various tools have been developed for specific purposes: GBI, GreenRE, Melaka Green Seals, pHJKR, and MyCREST are designed to evaluate green buildings; MyGHI and Sustainable INFRASTAR are intended for infrastructure assessment; and LCCF and CASBEE Iskandar focus on urban and city development. Additionally, MyCREST and Green PASS are tailored to assess green buildings throughout different stages of construction, including the construction phase, maintenance, and operations. Meanwhile, GBI and CASBEE Iskandar also assess townships, pHJKR can evaluate buildings, and GreenRE provides tools for measuring buildings, infrastructure, and townships (see Figure 1). To date, Malaysia has produced up to 49 tools that can evaluate various categories of buildings including infrastructure and township.

The flexibility and application of the Malaysian green building rating tool (GBRTs) vary. GBI, LCCF, and GreenRE can be applied nationwide, while Melaka Green Seals is specific to Melaka state, and CASBEE Iskandar is limited to Iskandar Malaysia. Tools such as pHJKR, MyGHI, MyCREST, Sustainable INFRASTAR, and Green PASS are mainly used for government projects. This is because contractors involved in these projects must comply with the GBRT requirements, as these projects are typically large in scale and have significant environmental impacts, such as the development of infrastructure and public facilities [23].

The oldest GBRT is the GBI tool, developed in 2009, while the most recent is the Green PASS, introduced in 2021. The development of GBRTs in Malaysia has been notably active between 2009 and 2021, with approximately 47 different GBRTs created by various organizations. As the oldest tool, GBI offers 18 categories of assessment, followed by GreenRE with 14 categories. This extensive coverage makes both GBI and GreenRE the most popular green building rating systems in Malaysia [24].

These tools can be classified into four main types: residential new construction, residential existing buildings, non-residential new construction, and non-residential existing buildings. GBI and GreenRE offer

additional categories, including tools for hotels, resorts, industrial buildings, interiors, hospitals, historic buildings, super low-energy buildings, and renewals. Infrastructure-specific tools are limited, with MyGHI being the only one designed to evaluate sustainable highways. LCCF focuses on township assessments, a category also found in GBI, GreenRE, and CASBEE Iskandar. Overall, Malaysia's GBRTs primarily evaluate green buildings, infrastructure, townships, and construction progress. The assessment is considered comprehensive, as there are tools that also evaluate historic buildings and interior spaces. Based on the comparison, GBI Township, GreenRE township and LCCF tools are the most appropriate to evaluate sustainable HEIs.

Table 1: Review of Malaysian GBRTs

Tool	**Application**	**Year**	**Types**	**Categories**
GBI	All states	2009	18	Non-residential new construction (NRNC), residential new construction (RNC), Non-residential existing building (NREB), NRNC data centre, NREB data centre, NRNC Retail, NREB Retail, NRNC hotel, NREB hotel, NRNC resort, NREB resort, township, hotel, NREB hotel, NRNC resort, NREB resort, township, Industrial new construction, Industrial existing building, Interiors, NRNC hospital tool, NREB hospital tool, NREB historic building
LCCF	All states	2011	1	Township
pHJKR	Gov. projects	2012	2	Building and Road
Melaka Green Seals	Melaka state	2012	4	Residential new construction, residential existing building, non-residential new construction, non-residential existing building
GreenRE	All states	2013	14	residential, existing non-residential, residential, existing residential, industrial, existing industrial, office interior, data centre, existing data centre, healthcare, township, infrastructure, super low energy, retail,
MyGHI	Gov. projects	2015	1	Highway
CASBEE Iskandar	Johor state	2016	3	Building, Urban development, city
MyCREST	Gov. projects	2018	3	Design, construction, Operation, and maintenance
Sustainable INFRASTAR	Gov. projects	2019	1	Infrastructure
Green PASS	Gov. projects	2021	2	Building construction, building operations

Semi-structured interview

The second phase of the research method is the semi-structure interview. The research aims to identify key educational indicators to be integrated into sustainable Higher Education Institutions (HEIs), contributing to

the development of sustainable cities, with a focus on selected public HEIs in Malaysia. As the interview involved human as a subject, the interview strictly adheres to ethical guideline throughout data collection process. The ethical approval was granted by The Research Ethics Committee (REC) of MARA Technology University, ensuring that the research complies with existing laws and regulations.

Sample Size

The research was conducted at six (6) selected public HEIs in Malaysia. The targeted respondents from the HEIs are those from the sustainability department, either academic or non-academic. The reason for choosing six (6) HEIs was based on similar study from Isa, Sedhu [25]. A brief overview of the study, including its aim and objectives, will be provided, along with assurance that responses are solely for research purposes and that all information will be kept confidential. As a token of appreciation, all respondents will receive a small gift, and the interview sessions will be conducted face-to-face at each selected HEI. The interview is expected to last around 30 minutes to one hour. Briefs of each interviewee are shown in Table 2. Each respondent from the selected HEIs was assigned an identifier (R1, R2, R3, R4, R5, and R6) to ensure the privacy of the collected data.

Data Collection

The face-to-face interview sessions started in May 2024 and ended in September 2024 at six (6) public HEIs. The selected HEIs are 1) UPM, 2) UTM, 3) UM, 4) UiTM, 5) UMP and 6) UNiSZA. The focused location was the sustainable department or office that was in charge of campus sustainability and the target respondents are the academic or non-academic staff. The interview sessions ranged 30 to 120 hours depending on the respondent's feedback on the questions. The choice language was significant as Malay language serve the primary means of communication among Malaysians. However, the interview guides were designed in both English and Malay Language to ensure effective communication since some of the terms are understandable in English.

Data Analysis

The interviews were audio-recorded and were further transcribed in English using clideo online tools and stored on a secure drive. The analysis of interviews was analyse thematically with the aid of ATLAS. ti. Software. Atlas. Ti software enables the automated text extraction of themes and sub themes from a text set. The themes were set pertaining to respondents' roles, and the sustainable education criteria. All themes coded before the identification of patterns within the data. At the end, all codes were generated through the network.

RESULTS

Result of comparison between GBI Township, GreenRE Township and LCCF tool

Figure 1 presents a comparison result of the three (3) assessment tools based on township criteria and indicators. In total, thirteen (13) criteria were identified in the assessment tools. The criteria are divided into 13 categories, focusing on aspects such as site setting and planning, transportation, energy, water, green building and sustainable construction, environment, waste, climate, community, innovation, biodiversity, flood and rainwater management, and traffic management. Among these, site setting and planning account for the highest percentage (21%) of indicators, followed by transportation (14%) and energy (10%), in relation to sustainable township development. In contrast, traffic management contributes the lowest percentage (2%) other than climate (3%) and flood and stormwater management (3%). Additionally, the traffic management indicator is exclusively found in the LCCF tool. On the other hand, innovation indicators are present only in the GBI Township and GreenRE Township tools. None of these indicators are found in the LCCF tools, indicating that the LCCF does not address the economic aspects of sustainability. The overall results indicate that none of the selected tools specifically incorporate education criteria in measuring

the sustainability of HEIs. This is confirmed through the detailed comparison of each tool assessment criteria Figure 1.

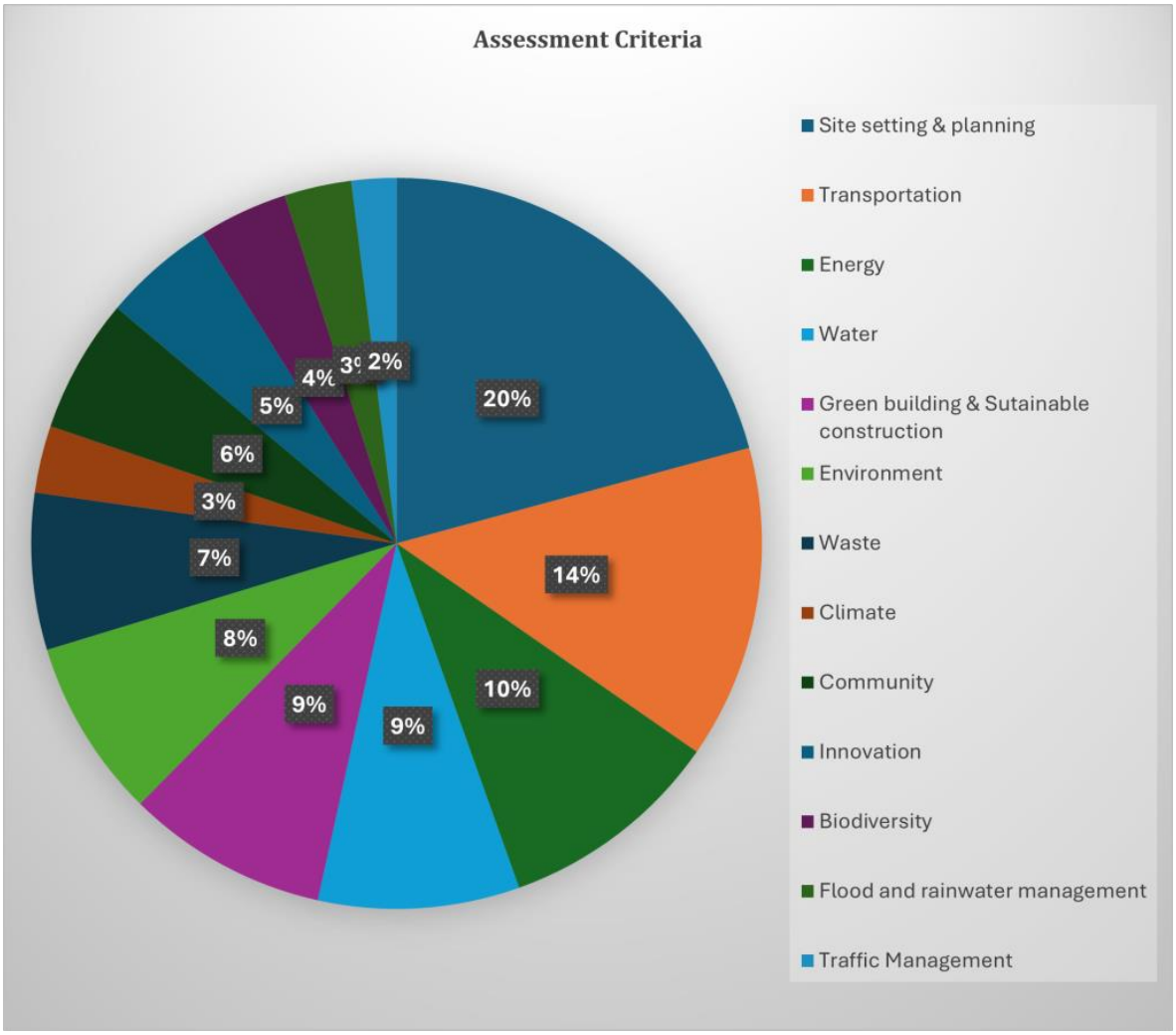

Figure 1: Assessment Criteria for GBI Township, GreenRE Township and LCCF tools.

Result of Semi-structure interview

Respondents' Background

Table 2 presents Section A demographic background of the semi-structured interview comprising 6 individuals. All respondents were categorized within sustainable office roles based on their respective Higher Education Institution (HEI). They are responsible for completing essential campus sustainability tasks to ensure each HEI meets the established sustainability criteria and indicators. Some respondents, such as respondent R3, are fully dedicated to sustainability activities, while others, including respondents R1, R2, R4, R5, and R6, have teaching and research responsibilities, as they are considered academicians. Respondent R1, from the Faculty of Design and Architecture, is part of the sustainability and green campus initiatives at UPM, along with 23 other members, and is responsible for the green campus outlook. Respondent R2 from Sustainable @ UM is gathering and organising all necessary data for university ranking submissions, including for the UI Greenmetric. R3 is from UTM Campus Sustainability (UTMCS) and is the Deputy Director of the UTMCS and works together with the Director and is responsible for the overall look of UTMCS sustainability planning, strategy and policy. R4 is from UiTM Green Campus (UGC). He is the coordinator of green initiatives and research. He is responsible for looking for all the campus sustainability criteria together with the other coordinators of campus and setting infrastructure, waste, water, energy and climate change, education and transport clusters. This is similar to R5 and R6, as both represent Green

UMPSA from UMP and Lestari UNiSZA from UNiSZA. R5 belongs to the Quality Education cluster, focusing primarily on overall educational quality, while R6 is part of the Water cluster, specifically addressing water-related initiatives in UNiSZA, including the maintenance of UNiSZA's lake. R1 and R3 oversee overall campus sustainability, R2 focuses on task force activities, while R4, R5, and R6 are responsible for specific green campus criteria.

Table 2. Respondents' Background

HEIs	Sustainable Department	Position	Teaching Roles	Roles	Respondent
UPM	Lestari @ UPM	Committee Lestari @ UPM	Yes	Green campus outlook at UPM	R1
UM	Sustainable @ UM	Officer	No	Gathering and organising all necessary data for university ranking submissions, including for the UI Greenmetric	R2
UTM	Sustainable Campus UTM	Deputy director	Yes	Works together with the Director and is responsible for the overall look of UTMCS sustainability planning, strategy and policy	R3
UiTM	UiTM Green Centre (UGC)	Coordinator Green Initiatives and research	Yes	Responsible for looking for all the campus sustainability criteria together with the other coordinators of campus and setting infrastructure, waste, water, energy and climate change, education and transport clusters	R4
UMP	MyGreen UMPSA	Head of Cluster Quality Education	Yes	Focusing primarily on overall educational quality	R5
UNiSZA	Lestari UNiSZA	Coordinator Head of Water	Yes	Specifically addressing water-related initiatives in UNiSZA, including the maintenance of UNiSZA's lake.	R6

Education Criteria

Sustainable Curriculum

The initial step toward establishing sustainable HEIs is the integration of sustainable curriculum design, encompassing sustainable programs, courses, learning outcomes, and related elements. Since the primary focus of HEIs has traditionally been academic achievement, introducing sustainable programs and courses can significantly contribute to various professions, ultimately supporting the development of sustainable cities.

"Sustainability program and sustainability courses can be found in all faculties, but most of it are from the Faculty of Built Environment" [R4]

"When we talk about Architecture, it has to be sustainable" [R1]

According to the interview findings, all participating HEIs have integrated sustainability into their programs and courses, as evidenced on their respective sustainability websites. R4 further emphasized that the Faculty of Built Environment is the most responsible for delivering sustainable programs. Additionally, R4 highlighted that the responsibility for sustainability extends beyond the label "sustainable" and is embedded within the unique sustainability roles of each program.

Sustainable Research and Innovation

Research and innovation are key priorities for each HEI, significantly contributing to the innovation industry. Similar to sustainable curriculum design, integrating sustainability into research and innovation is crucial to ensure that every research initiative supports the sustainable development goals. Sustainable research and innovation in HEIs should encompass aspects such as sustainable publications, sustainable research practices, open access to research, sustainable conferences, collaborative efforts, and other related elements.

"They are starting to include green and sustainability keywords in every research application and publication" [R5]

"They must be SDGs impact in every research grant submitted" [R1]

Each participating HEI has actively worked toward achieving all 17 SDGs by embedding relevant SDG keywords into their research activities, as emphasized by R1 and R5. Integrating sustainable research and innovation not only fosters the development of sustainable professions but also contributes to building a sustainable community across various income levels, industries, and age groups which is important in developing and maintaining a sustainable city. This is proven from the respondent R2.

"UM has four types of research grants. It is the secular economy, carbon exploration, eco campus living lab and SDG lab" [R2]

Setting and Infrastructure

As highlighted in the previous section of this research, setting and infrastructure account for the largest contribution to developing sustainable cities. While the primary focus of HEIs may not be infrastructure, the educational perspective on setting and infrastructure is essential. This includes creating sustainable platforms such as websites, social media channels like Facebook, Instagram, and TikTok, sustainable reports, sustainability guidelines, and related initiatives. These elements play a vital role in spreading sustainability awareness and guidelines, reaching both the HEI community and a global audience.

"We promote sustainability though social Media like Tiktok account, Instagram and Facebook" [R6]

"We have university sustainability blueprint" [R3]

Community Engagement

Community engagement is a crucial factor in developing sustainable cities through sustainable HEIs, given their significant population. Interview findings indicate that, from the perspective of sustainable education, community engagement should encompass sustainable student and staff organizations and activities, corporate social responsibility initiatives, related start-ups, and other relevant elements. The interview findings revealed that all participating HEIs have implemented community engagement initiatives. These efforts directly contribute to target 11a of SDG 11 by enhancing economic, social, and environmental planning.

"The sustainable staff organization activities are from ourselves which is our sustainable department as we do sustainable activities" [R4]

"We reproduce chicken feather to get the best cost tools" [R5]

"We have the 'Gelam Oil' project, initiated by our lecturers and students. This project utilizes the Gelam tree to produce 'Gelam Oil,' which we then market and sell" [R6]

Teaching

The final criteria is the teaching, which differs from the curriculum criteria by emphasizing the importance of HEIs in providing sustainability-related training, including orientation programs and ongoing training. While most criteria focus on developing 'sustainable students,' this criterion is primarily concerned with the academic and non-academic staff within the HEI community.

"Yes, we provide training for facilitators during orientation and deliver talks as part of the program. While we accommodate requests for ongoing training, we are also planning to establish a dedicated training program for staff. Additionally, certain staff members are required to complete at least one sustainability course" [R2]

All participating in HEIs integrate sustainability education into their programs, demonstrating a commitment that impacts not only SDG 4 (Quality Education) but also SDG 11 (Sustainable Cities and Communities). The influence of sustainable education extends far beyond the campus, shaping individuals throughout their entire life cycle. This approach ensures that the principles of sustainability remain a lifelong pursuit, continuing well beyond graduation.

DISCUSSION

The development of sustainable cities should extend beyond urban and suburban areas to include Higher Education Institutions (HEIs), given their rapid growth and increasing population. Integrating sustainable education as a key component in the framework for evaluating sustainable cities is vital, particularly for HEIs, where its significance is amplified. Education is a cornerstone of progress in every nation and serves as a powerful catalyst for development. It is among the most effective tools for reducing poverty, enhancing health outcomes, promoting gender equality, fostering peace, ensuring stability, and driving numerous other positive societal transformations. The development of various Green Building Rating Tools (GBRTs), beyond just the creation of green buildings, highlights the sustainability efforts undertaken by both the Malaysian government and the private sector. This includes tools for evaluating sustainable cities, such as the GBI Township, GreenRE Township, and LCCF tools. However, these evaluation methods are considered incomplete for assessing sustainable cities, as they fail to incorporate the element of sustainable education when measuring the sustainability of higher education institutions (HEIs). According to the results of semi-structured interviews conducted at six public HEIs, sustainable education should encompass sustainable curriculum, sustainable research and innovation, setting and infrastructure, community engagement, and teaching. These elements not only contribute to the development of sustainable cities but are also being integrated into the educational framework of all participating HEIs. Therefore, incorporating these elements into the evaluation of sustainable HEIs is both relevant and necessary.

CONCLUSION

The research seeks to examine the role of Higher Education Institutions (HEIs) in advancing Sustainable Development Goal (SDG) 11, with specific consideration of institutional size and population. To achieve this aim, two primary objectives were established:

1. To identify gaps in existing Green Building Rating Tools (GBRTs) for evaluating sustainable HEIs, particularly in the context of sustainable cities. A comparative analysis of GBRTs in Malaysia revealed the existence of various tools designed to measure sustainability, not only for individual buildings but also for diverse infrastructure, including townships. Among these, the GBI Township, GreenRE Township, and LCCF tools emerged as the most relevant for assessing HEIs. However, these tools lack essential elements related to sustainable education, making them inadequate for comprehensively evaluating sustainable HEIs. Sustainable education is a critical component of sustainable cities [4], and its absence is a significant limitation, especially considering that education is

central to the mission of HEIs. The comparative analysis identified a clear gap: the omission of sustainable education criteria in the existing tools used to measure sustainable HEIs.

2. To address this gap, the second objective was achieved through semi-structured interviews conducted with representatives from six selected HEIs. These interviews aimed to identify key elements of sustainable education that could be incorporated into the assessment framework. The findings revealed five essential components of sustainable education: sustainable curriculum, sustainable research and innovation, campus setting and infrastructure, community engagement, and teaching practices. These elements were consistently present across the participating institutions and are recommended for inclusion in tools designed to evaluate sustainable HEIs.

The study concludes by emphasizing the need for sustainable education to transcend the boundaries of campuses, advocating for a lifelong approach to sustainability awareness and education that extends throughout the human life cycle. This holistic approach is essential for fostering sustainable development in the broader context of urban sustainability.

ETHICAL CONSIDERATION

The ethical approval was granted by The Research Ethics Committee (REC) of Universiti Teknologi MARA, ensuring that the research complies with existing laws and regulations.

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CONFLICT OF INTEREST

No potential conflict of Interest was reported by the Authors.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study can be obtained from the corresponding author upon reasonable request.

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