

Sustainability in Higher Education: Perspectives of Malaysian Higher Education System

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Abstract

Sustainability describes how a system remains diverse and productive; this is the potential for long-term maintenance of well-being having ecological, economic, political, and cultural dimensions. Education for sustainable development (ESD) emphasizes on including the key sustainable development issues into teaching and learning, that is, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption. This effort requires effective pedagogy to ensure a participatory teaching and learning method that will motivate and empower future leaders to ensure sustainability in their social systems. Malaysia has incorporated the principles of Agenda 21 as one of the important sustainable development documents into its national planning process. However, the effectiveness of these teaching–learning programs, and their effective pedagogical approaches and endpoints are not satisfactorily ensured. Therefore, at first, this article reviews the existing various programs and research activities of public and private higher educational institutions in Malaysia that address sustainability. It then discusses the pedagogical approaches of these programs and how they are related to the key concept of the ESD. Finally, some conclusions and recommendations have been suggested to improve the initiatives to develop a scientifically sound and effective pedagogy for the ESD programs in higher education systems in Malaysia.

Keywords

education for sustainable development (ESD), pedagogy, higher education system, disaster risk reduction, sustainable consumption

Introduction

Education for sustainable development (ESD) or sustainability education (SE) suggests for a scientific and balanced curriculum that will encompass sustainability in the academic courses and research. However, they are very poorly understood and implemented, and little attention has been paid for a holistic effort to build a generation having awareness and willingness to work for sustainable development. The education perspective brings significance to the individual's learning, such as the pedagogy, and the emancipation. These perspectives of sustainable development combine the aspects of policy and management of processes in institutions and communities. Therefore, there appears to be a consensus that ESD as a force, phenomenon, or tool within the contemporary education includes issues of ethics, equity, and new ways of thinking and learning. In the educational system, formal and nonformal means of pedagogy have to be reckoned with, and they all add values.

In recent time, sustainability challenges the current paradigms, structures as well as effective practices in higher education. Universities and higher education institutions are facing this reality as they need a meaningful contribution to

sustainability (Tilbury, 2011). Higher educational institutions (HEIs) are leading social and cultural changes from the forefront through research-based findings and also through the education of intellectuals, leaders, and future makers (Lozano, 2006). This is also argued that higher education can change the world through training and expand young minds, researching answers to challenges and supporting public policies. HEIs also can showcase an example to the society through its understanding and commitment through careful campus management. Eventually, they have been taking the responsibilities to providing capable employer and active member of the business and local communities (Galang, 2010; Lotz-Sisitka, 2011).

In the early 1970s, Stockholm Conference on the Human Environment (United Nations Environment Programme

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[UNEP], 1972) was the first initiative to identify the role of higher education in progressing sustainable development at the international level formally, followed by the Belgrade Charter (1976) and the Tbilisi Declaration (1977; <http://www.gdrc.org/uem/ee/tbilisi.html>). These are the outcomes of the world's first Intergovernmental Conference on Environmental Education organized by UNESCO in cooperation with the UNEP. Brundtland Report—"Our Common Future" (1987; <http://www.un-documents.net/our-common-future.pdf>) is the further development of the idea of sustainable development and the United Nations Conference on Environment and Development (United Nations Sustainable Development, 1992); all acknowledged the importance of education and, in particular, higher education in progressing sustainability in our societies and around the world. In 1997, a Kyoto Protocol treaty was an initiative to reduce emissions of greenhouse gases among developing countries. In 2000, the United Nations launched the Millennium Development Goals with a focus on reducing poverty and improving educational opportunities. Agenda 21 (Chapter 36) has recognized education, public awareness, and training as integral parts in helping the successful implementation of sustainable development (United Nations, 1992). Education is essential for promoting sustainable development and potential for improving the capacity of the people to address environment and development issues. Many public universities in Malaysia have taken vital initiatives to transform into an institution of higher learning with sustainability as their central agenda. According to Mader (2007, p. 23), "Universities educate future decision makers and bridge the gap between research and society. Universities also have the role of transmitting knowledge to societies." As a matter of necessity, the future graduates will require a clear understanding of sustainability to successfully leading the nation.

Therefore, at first, this article reviews the socioeconomic trends of Malaysia that facilitate the concept of sustainable development initiatives in various sectors, particularly in the HEIs. Then, Agenda 21, the principal driving force of implementing the notion of sustainability in different areas, has been discussed. Eventually, the existing programs and research activities of public and private HEIs in Malaysia that are addressing sustainability in their academic activities are covered in a logical way. It will then discuss the pedagogical approaches of these programs and how they are related to the fundamental concept of the ESD. Finally, some conclusions and recommendations have been suggested to improve the initiatives to develop a scientifically sound and effective pedagogy for the ESD programs in the higher education systems of Malaysia.

Trends of Malaysia's Socioeconomic Development and the Scope for ESD

Malaysia as a nation has experienced unprecedented economic growth over the last three decades. The booming education sector also contributes to the national economy.

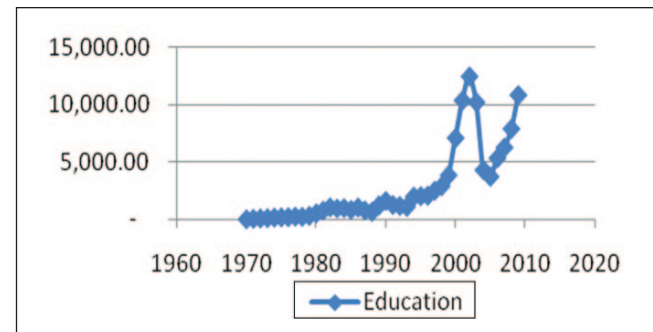


Figure 1. Federal government development expenditure on education from 1970 to 2009.

Source: Ministry of Finance.

Therefore, Malaysia needs to ensure its continued efforts to invest in human capital to achieve a sustainable growth trend. So far, the government's investment priority has been placed on the education sector, particularly on the higher education sector, as proven by the spectacular increase in the number of HEIs that have mushroomed within the last 15 years. The 10th Malaysian Plan has allocated 40% of the total development expenditure (RM 92b) on human capital development programs, which is double the Ninth Malaysian Plan allocation (21.8% in 9MP). Reflecting from the 1960s when Malaysia or Malaya, as it was known then, had only one university to boast of, the University of Malaya (UM). Now, Malaysia has 20 public universities, 41 private universities and university colleges, and 485 private colleges.

Figure 1 indicates the government's interest in expanding HEIs and the corresponding level of investment in higher education from the year 1970 to 2009. It shows an increasing trend in these two individual statistics, indicating the importance of education in developing Malaysia. While this is compared with the feature of economic growth in Malaysia (Figure 2), it reveals that there is a significant relation between the economic growth and government plan to expand HEIs to lead in the educational horizon of the region.

These statistics reveal the direct correlation between the level of investment in higher education and the astonishing economic growth experienced in Malaysia. Besides, this policy stand showed a significant positive correlation with the increasing number of students in the HEIs (Figure 3). The trend of gradual increase in the number of students is very consistent in the public HEIs than in the private HEIs. However, there is a little correlation observed with the Teacher's Training Institutes and Polytechnic Institutes. As mentioned earlier, in conjunction with the need to sustain economic progress in tandem with advancement in higher education, it needs to focus on producing excellent academic leaders who possess the right blend of knowledge, skills, and attitude to drive the HEIs in the right direction for sustainable development practices.

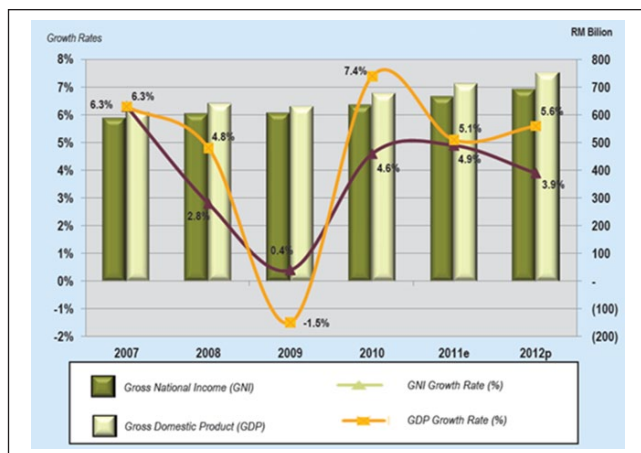


Figure 2. Economic growth of Malaysia from 2007 to 2012. Source. Department of Statistics Malaysia. Note. Showing gross national income (GNI), gross domestic product (GDP), and growth rates at constant 2005 prices.

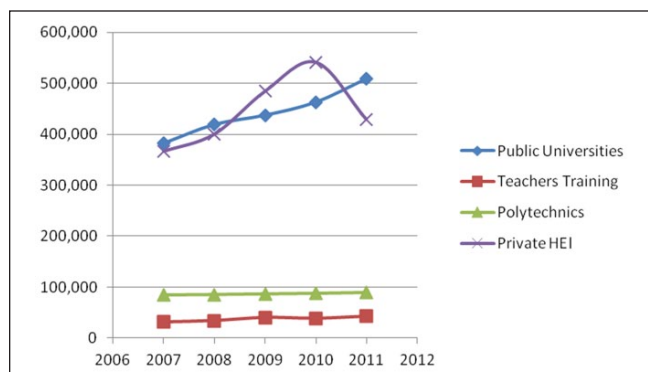


Figure 3. Number of students in different higher education institutions. Source. Department of Statistics Malaysia. Note. HEI = higher educational institution.

Agenda 21 in Implication for Sustainability: Malaysian Perspectives

Malaysia has incorporated the principles of Agenda 21 as one of the important sustainable development documents in its national planning process (Hassan, 1998; Ngah, Mustafa, Zakaria, Noordin, & Sawal, 2011). Malaysia's recent 10 innovative initiatives for sustainable development within the context of Agenda 21 are noteworthy. From high-tech *smart villages*, *smart cities*, and *sustainable condominium* to *greening higher education campuses* are among the innovative ideas. Malaysia has implemented it in the country's development planning and monitoring systems. In particular, the Malaysian 5-year plans (Malaysia Plan) accounted this Agenda 21 with high priority for various sectors (Makmor, Ismail, Hashim, & Nasir, 2012). It is observed that many governmental departments and agencies have been following this policy directive in implementation. For example, Ministry of

Housing and Local Government (MHLG) initiated the Local Agenda 21 (LA 21) Pilot Projects in four pilot sites. These projects also mobilized the local community to be involved in dealing with their problems, a bottom-up approach. The Prime Minister's Department has launched initiatives to eradicate poverty and to bring awareness for sustainable development. Similarly, most of the city corporations also adopted LA 21 for the awareness on sustainable development among the communities as well as for the sustainable development activities of their cities (see LA 21 Malaysian website: http://www.dbkl.gov.my/la21kl/index.php?menu=2&pg=pengenalan/la21/la21_malaysia; and also Putrajaya City Corporation website: http://www.ppj.gov.my/portal/page?_pageid=311,1&_dad=portal&_schema=PORTAL#2048). Nevertheless, many international agencies like World Wide Fund for Nature's Malaysian (WWF-Malaysia) office have taken initiatives to promote sustainable development concept among the younger generation through Eco-Schools program.

Simultaneously, academic institutions have taken many initiatives to incorporate the themes of Agenda 21 within their academic syllabuses as well as campus-based activities. In particular, HEIs have introduced sustainable development issues into their curricula for teaching, learning, and research. Institutes and centers have been established in different universities aiming to set the target to achieve sustainability. However, evaluation of the effectiveness of these teaching-learning programs, and their pedagogical approaches and endpoints has not been done adequately.

Sustainability in Malaysian Higher Education

Sustainability in Pedagogy

The academic programs offered by the HEIs of Malaysia were reviewed to see how these institutions are addressing different aspects of sustainability in their academic programs. Table 1 documents the field of study and programs offered at various levels. It revealed that sustainability has been covered within science, social science, and engineering disciplines at the graduate and postgraduate levels. There are some institutes and centers that have been offering the multi-disciplinary approach to teaching and learning of sustainability. Some of these are concentrated on research and relate research to the policy. While it is important to evaluate how students are learning from these approaches of sustainability regarding knowledge development, it is also important to know how these approaches are building their sense of responsibilities to implement those in their practical life and use for the social development. The role of an institution to that extent was not verified using an appropriate methodology. However, consultation with various academic experts from different HEIs revealed that a comprehensive evaluation scheme is still lacking. While searched the key sustainable development issues, for example, climate change,

Table 1. Typical and Major Sustainability Programs Offered by Malaysian HEIs.

University/college	Faculty/institute/school/Kulliyah	Field of study	Programs offered
UKM	Faculty of Science & Technology	Environment & Natural Resources	<ul style="list-style-type: none"> Environmental Sciences & Natural Resources (for graduate and postgraduate taught courses and research)
	Faculty of Social Science & Humanities	Environment	<ul style="list-style-type: none"> Environmental Studies (for graduate and postgraduate taught courses and research)
	Faculty of Engineering & Built Environment	Environmental Engineering	<ul style="list-style-type: none"> Environmental Engineering Expert Systems for Solid Waste Management (for graduate and postgraduate taught courses and research)
	LESTARI Institute for Climate Change	Environment and Development Climate Change	<ul style="list-style-type: none"> Multi-, Cross-Disciplinary and Policy Research (for postgraduate research)
UM	SEADPRI	Disaster Research	<ul style="list-style-type: none"> Postgraduate Research on Climate Change
	Research Centre for Tropical Climate Change System	Climate Change Science	<ul style="list-style-type: none"> Postgraduate Research, Training on Climatic, Geological and Technological Hazards (multidisciplinary) Postgraduate Research on Climate Change Science (for postgraduate taught courses and research)
	Faculty of Arts and Social Sciences	Environment and Geography	<ul style="list-style-type: none"> Environment and Geography (for graduate and postgraduate taught courses and research)
	Faculty of Science	Biodiversity and Environment	<ul style="list-style-type: none"> Ecology and Biodiversity Sciences and Environment Management Sciences and Technology Studies
USM	School of Housing, Building & Planning	Environment and Disaster Management	<ul style="list-style-type: none"> Sustainability Science (for graduate and postgraduate taught courses and research) Environmental Sciences & Technology Environmental Management
	CGSS Faculty of Environmental Studies	Sustainability Research Biodiversity and Environment	<ul style="list-style-type: none"> Environment (for graduate and postgraduate taught courses and research) Disaster Management (PhD program) Sustainability Studies (postgraduate research) Environmental Science & Technology Environmental Management (graduate program) Environmental Studies
UPM			<ul style="list-style-type: none"> Biodiversity and Conservation of Natural Resources (for graduate and postgraduate taught courses and research)
			<ul style="list-style-type: none"> Natural Disaster (postgraduate research) NBC Environmental Impact and Protection (postgraduate research)
UMS	Natural Disaster Research Unit	Disaster Management	<ul style="list-style-type: none"> Biodiversity and Conservation
UPNM	Faculty of Medicine and Defence Health	Disaster Management	<ul style="list-style-type: none"> Biotechnology (postgraduate research)
UNISEL	Faculty of Science & Biotechnology	Biodiversity and Conservation	<ul style="list-style-type: none"> Architecture and Environmental Design (for graduate and postgraduate taught courses and research)
IIUM	Kulliyah of Architecture and Environment Design	Environment	<ul style="list-style-type: none"> Architectural Studies
KLJU	Faculty of Architecture & Built Environment	Environment	<ul style="list-style-type: none"> Built Environment (for graduate and postgraduate taught courses and research)
SEGI College	Faculty of Engineering & the Built Environment	Environment	<ul style="list-style-type: none"> Environment Technology
Taylor's University	School of Architecture, Building & Design	Environment	<ul style="list-style-type: none"> Environmental Sciences by Research (for graduate and postgraduate taught courses and research) Foundation in Natural and Built Environments (graduate course)
UTAR	Faculty of Engineering & Green Technology	Sustainability	<ul style="list-style-type: none"> Foundation in Natural and Built Environments (graduate course) Environmental Engineering Environmental Science (for graduate and postgraduate taught courses and research)

Note. HEI = higher educational institutions; UKM = Universiti Kebangsaan Malaysia; LESTARI = Institute for Environment and Development; SEADPRI = Southeast Asia Disaster Prevention Research Initiative; UM = University of Malaysia; USM = Universiti Sains Malaysia; CGSS = Centre for Global Sustainability Studies; UPM = Universiti Putra Malaysia; UMS = Universiti Malaysia Sabah; UPNM = National Defence University Malaysia; NBC= Nuclear, Biological, and Chemical; UNISEL = University of Selangor; IIUM = International Islamic University of Malaysia; KLIU = Kuala Lumpur Infrastructure University; UTAR = Universiti Tunku Abdul Rahman.

disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption, are being addressed in the curriculum, a significant knowledge gap was observed among the various programs offered by these institutions.

Sustainability in Academic Research

In Malaysia, recently many research projects of HEIs have aimed to identify the potential barriers and probabilities for applying sustainable approaches to various sectors. Green Technology is one of them which incorporates the development and application of products, equipment, and systems used to conserve the natural environment and resources, which minimizes and reduces the negative impact of human activities (<http://www.kettha.gov.my>). Lay, Ahmad, and Ming (2013) also reported about high-technology adoption cost, lack of environment knowledge, lack of green awareness, lack of trust, adoption cynicism, institution adoption rate, and switching as the concerning issues for Green Technology. This study used a secondary source of reading previous studies to identify barriers existing in applying the Green Technology.

However, sustainable development required economic growth in line with poverty alleviation, social welfare, and environmental conservation (Siwar, 2004). A human economy should consider the availability of the resources for future generation, and participation of communities must be ensured for adapting them with local action. In that context, a considerable number of research projects have been done on the socioeconomic aspects of sustainable development. While it is also reported that education for sustainability helps in better understanding of the environment, raising awareness on the importance of environment, constructing ethical society, enhancing the students' good characteristics, and produce a balanced human being (Azizan, 2009). Hence, HEIs play a leading role in achieving sustainable development.

In the Universiti Kebangsaan Malaysia (UKM), research has been conducted using three models: Knowledge, Attitude, and Practice (KAP) tool on a sample of 191 students and 45 staff. Data were collected using validated questionnaires and evaluated by descriptive analysis. Findings indicated that knowledge about sustainability among student and staff is different, while both staff and student showed a similar positive attitude about the idea of adopting a sustainable lifestyle, and practice for a friendly environment (Nur'ashiqin et al., 2011).

Shari and Jaafar (2006) experimented the level of integration and implementation on sustainability issues in the academic curriculum of the schools of Architecture in Malaysian HEIs. The study used questionnaires to collect data from the students who were selected randomly from public universities and private HEIs. The questionnaire was divided into quantitative and qualitative parts. SPSS software used as a tool to analyzing data. This study suggests organizing more

programs to increase awareness among teachers and learners, to revise the existing curriculum and provide more scientific pedagogy which addresses sustainability, and increases funding for more in-depth research and also to modernize the research facilities.

Strengths and weaknesses of sustainable higher educational (SHE) assessment approaches were studied by Saadatian, Dola, Salleh, and Tahir (2011). SHE is a tool or framework which assesses the level of sustainability in HEIs. The method used is archival research technique, content analysis, and interview. The study has identified 18 popular SHE assessment approaches, out of which Campus Sustainability Assessment Framework (CSAF) was found to have more strength in comparison with other SHE assessment approaches.

Evaluation of Effectiveness of ESD

The different aspects of sustainability may cover with various programs, but a student very often failed to relate those from their individual sets of modules of the program, this is because the relationship of these aspects is not included in their detail syllabus. As a result, for example, green-economy students can rarely identify the importance of ecosystem approach in sustainable development. However, a student of Ecology and Natural Resources Management experiences difficulties in relating his or her knowledge with sustainable infrastructural development or to the sustainable city planning practices of a region. The situation is similar for a student of a mono-disciplinary or a multidisciplinary institution as well.

Also, research outcomes of a field-based pedagogical approach (Reza, Choy, & Pereira, 2013) revealed that it is important to have a case or field-based learning approach which may help students understand sustainability in a broad and efficient way. This study summarizes that a more field-based practical pedagogical approach is crucial for graduate students who are more mature and at the final stage to take the responsibility of social services. Therefore, academia should take this vital issue into account while they design a curriculum for their graduate students. It is not enough to incorporate some modules such as field-based practical activities, and it is much important to provide adequate financial and structural support to make the program more effective.

The mission and vision of 13 public and private HEIs of Malaysia, which are known as good academic institutions, were also studied (Table 2). It is revealed from the table that the institutions show some of the great ambitious visions, and they do not differ much among these establishments. However, questions arise how these organizations are achieving these goals gradually. Thus, it can be recommended for further evaluation in this regard from the institutional as well as the student's point of view. However, principally, it was tried to identify how these institutes are offering the courses.

Table 2. Mission and Visions of Different Institutes, Centers and Faculties of the HEIs of Malaysia With the Proportion of Representation in Covering Sustainability Courses.

Institute/ center	Types of programs	Vision	Mission	Prop %
UKM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To make Malaysia as an international reference center To be a center of excellence in research and training in Malaysia and the Asia Pacific Generating innovative research and knowledge sharing To conduct basic and applied research for better understanding To maximize the effectiveness of academic programs Integrating research results with sustainable development 	<ul style="list-style-type: none"> Balancing trade-offs between environment and development. Linking policy and building capacity to meet the aspirations of sustainable development Enhance human capital and capacity at national and regional levels Support knowledge-based decision making for sustainable development Facilitate and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	65
UM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	65
UMS	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	40
UniMAP	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	20
UNIMAS	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	30
UTM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	40
UiTM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	30
UMP	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	25
USM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become a leading academia in knowledge development and research in SEA region To be a leading academic institution in environmental-related academic activities 	<ul style="list-style-type: none"> To promote and coordinate Malaysian scientific efforts to global sciences To promote multidisciplinary and cross-institutional research, and to influence policies and decisions Promote and maintain Malaysia's presence as a significant player in Antarctic research To influence public attitudes and promote community involvement in sustainability To be a research and reference center in sustainability science To provide well-trained and skilled manpower in the field Market-driven educational programs and strategic research To produce human capital to serve the nation's development and industrial competitiveness agenda 	70

(continued)

Table 2. (continued)

Institute/ center	Types of programs	Vision	Mission	Prop %
UNITEN	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To become center of excellence of research on environmental aspects at local, regional, and global scales To be recognized nationally and internationally for excellence and leadership in application of Sustainable/Green Technology to conserve the natural environment and resource To be the premier energy policy research institute in Malaysia and the Asia-Pacific Region 	<ul style="list-style-type: none"> Providing and promoting research on sustainable development Develop strong networking with internationally reputed centers and organizations Advancing engineering knowledge through research and design in sustainable/Green Technology and ecosystem management for conservation of environment To conduct independent research and contribute toward capacity building in energy and environment issues relevant to the country's socioeconomic goal which will benefit the public, government, regulators, industry, and academia 	40
UTAR	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> The establishment of a leading center of excellence for research, development, and commercialization of natural resources To be a center of excellence in leading-edge basic and applied research for environmental engineering and Green Technology 	<ul style="list-style-type: none"> To promote multidisciplinary research, product development, and training of personnel in priority areas to drive local industries toward sustainable utilization of natural resources To establish a focal point for research and development in various aspects of environment and Green Technology, to develop niche green technologies meeting national and regional needs, and to provide education and training opportunities in Green Technology for students, public, industries, and local professionals To establish a focal point for relating business and engineering sector devoted to support sustainable development through innovative research and development 	20
MMU	Sustainable system management (postgraduate level)	<ul style="list-style-type: none"> To produce graduates with skills in business and engineering management to become the change agents in technology and sustainable energy industries To develop business leaders who are innovative and able to spearhead the advancement of technology-based industry in the country 	<ul style="list-style-type: none"> To establish a focal point for relating business and engineering sector devoted to support sustainable development through innovative research and development 	10
UPM	Taught courses and research in graduate and postgraduate level	<ul style="list-style-type: none"> To be an excellent international research center for sustainability studies To be a leading research center for the advancement of sustainable agriculture Become a world-class research institute in the field of nanotechnology and advanced materials 	<ul style="list-style-type: none"> To develop high impact and competitive research to generate new knowledge and human capitals for achievement of sustainability To provide and stimulate economic growth through interdisciplinary, cutting edge and knowledge-intensive research activities Contribute significantly toward sustainable development and conserving natural resources 	50

Note. HEI = higher educational institutions; UKM = Universiti Kebangsaan Malaysia; UM = University of Malaysia; UMS = Universiti Malaysia Sabah; UniMAP = Universiti Malaysia Perlis; UNIMAS = Universiti Malaysia Sarawak; SEA = Southeast Asia; UTM = Universiti Teknologi Malaysia; UTM = Universiti Teknologi Mara; UMP = Universiti Malaysia Pahang; USM = Universiti Sains Malaysia; UNITEN = Universiti Tenaga Nasional; UTAR = Universiti Tun Abdul Razak; MMU = Multi-Media University; UPM = Universiti Putra Malaysia.

It is observed that the strategy taken by the Ministry of Higher Education (MoHE; 2007, 2010), Malaysia, has a significant impact on these organizations. However, the degree of representation of the sustainability disciplines were found to be varied largely among different institutions offering those into their academic courses. The further in-depth study may define the impact of these courses, while the number of students and the ratios will be obtained from the continuous monitoring and time-series data.

Minghat and Yasin (2010) investigated sustainability in HEIs system emphasizing on Technical and Vocational Education in Malaysia. The qualitative research method is used in this study interviewing 12 respondents according to their position. Findings showed that 16 elements contribute to sustainable development. These elements are creativity, innovation, networking and partnerships, staff development programs, methods of teaching, generic skills, industrial relations and training, counseling, entrepreneurship, information and communications technology (ICT) skills, benefits, recognition, knowledge, competency-based training, articulation, and management commitment.

Education for sustainability is a process of developing concerns, abilities, attitudes, and values toward the next leadership of society. This process ensures their participation in sustainable development activities more effectively in the local, national, and international levels and helps them to work toward a more sustainable future (Lea, Stephenson, & Troy, 2003). University students do not only get knowledge in their particular area but also gain more than the academic degrees. Higher institutions of a region are responsible to their society, and leaders of these academies should relate various aspects and issues of sustainability in their research niche through innovation, technology transfer, engaging with the community, and interact with mass people. Hence, it is important for the education system to be harmonized with sustainable development aspects effectively in HEIs (Zain et al., 2009).

Sustainability in Practice (Other Than the Formal Curricula)

Green Campus Initiative is one of the initiatives that is in fact a better approach to make the future generation aware of sustainability. Owens and Halfacre-Hitchcock (2006) reported that several researchers acknowledged the positive role of HEIs in promoting sustainability through such program. In Malaysia, several universities such as UKM, UM, Universiti Sains Malaysia (USM), Universiti Teknologi Malaysia (UTM), and Universiti Putra Malaysia (UPM) have a similar program. In UKM, a forum of “Sustainable Campus” (generally known as *Kampus Lestari*, in the Malay language) works on building awareness and promoting a culture to leave through sustainability and green livelihood. The USM and UTM also have similar programs. UKM’s another program on a sustainable river flow “Flow or Knowledge” (known as *Alor Ilmu*, in the Malay language) also incorporated various stakeholders to become aware of ecology and sustainability. Both these “*Kampus Lestari*” and “*Alor Ilmu*” have been

organized and managed by the Institute for Environment and Development (LESTARI), which has been established for promoting sustainability in the academia as well as to link with the practitioners and the policy makers. The meaning of LESTARI is sustainability, which is a product of Agenda 21 and the Malaysia’s global agreement of initiatives for sustainability. In practice, these programs may provide strong messages to all related with the institution. Although these are not a usual pedagogical approach, it has an immense impact on society; this is also an important objective of sustainability in pedagogy. However, students who do not have a sustainability course in their graduate or postgraduate study may also be aware of the approach and understand the importance of a green and sustainable environment having integrity, beauty, and safety.

Concluding Remarks

It revealed that considerable efforts had been put forth by the governmental initiatives to include sustainable development agendas in higher education system in Malaysia. As a result, a satisfactory proportion of academic courses have been devoted to sustainability studies. However, many aspects of sustainability are yet to be included in the educational systems; that is, curriculum, pedagogy, extracurricular and campus-based activities. Implying, that the domains of sustainability—environment, economy, and society, are interrelated and thus they all have to be weighted by a significant proportion in various initiatives. At the same time, a scientific evaluation scheme should apply to evaluate the outcomes of these approaches to the students, and this is particularly lacking in Malaysian education system.

Development of a suitable and effective pedagogy for operative teaching–learning is necessary. Therefore, it is important to evaluate the effectiveness of existing curriculum and modules, and changes in restructuring or improving the curriculum based on in-depth research must be taken into account from time to time. Besides, an all-inclusive center or faculty for learning and research of all domains of sustainability, including climate change, disaster risk reduction, biodiversity, renewable energy, sustainable business, Green Technology, poverty reduction, and sustainable consumption, is needed. Presently, no institute or center exists having all these domains under the same umbrella. Although many aspects have been addressed separately across the HEIs, the integration and coordination of the outcomes are not sufficiently done. Therefore, the outputs of many research projects have remained in dark and failed to contribute to the society. As a result, the effort of sustainability remains far away from the adequate achievements. A national platform designated for integrating various institutions devoted to achieving sustainability goals may be helpful. Furthermore, a more in-depth study is required to evaluate the effectiveness of the programs, identifying gaps in the pedagogy and developing effective curriculum for sustainability knowledge development and relating them to the society. In addition to that, all parties need to overcome the limitations of working on the same platform to establish a sustainable society at the national to the regional scales.

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