A MODEL OF SUSTAINABLE CAMPUS OPERATIONS FOR MALAYSIAN PUBLIC UNIVERSITIES

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For my beloved mom and dad….

Siti Sara binti Hj. Lateh (1949 – 2012, al-fatihah)

&

Razman bin Dahalan

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ABSTRACT

Currently, various initiatives have been undertaken by several universities around the world to ensure that their campus operates sustainably. Unfortunately, it seems that the efforts are still divergent and not systematically applied within the universities. Several models are available to be used as references for developing and implementing sustainability within campus. However, for local universities in particular, it is extremely important to understand the current situation whether there is a dearth of adequate conditions for the establishment and compliance of all phases of the models. As the issues of sustainability in Malaysia are still new, sustainability in universities should be performed in rather small steps according to the needs and situation of the university itself. Therefore, this study focuses on identifying the relevant Sustainable Campus Operation (SCO) initiatives to be implemented at the Malaysian public universities, and also determining the critical factors of governance that influence the successful implementation of the SCO initiatives. The investigation involves a quantitative approach using structured questionnaire survey, which was designed based on the items obtained from websites of sustainable universities around the world and also from literature review. The questionnaire survey forms were distributed to sixty-eight selected respondents at the Development Office or Sustainable Department of all local public universities. Based on the structural relationship model, it was found that the factor's group of "Accountability to improve performance of SCO (AccF)" has the highest impact and more significant in implementing the thirteen relevant SCO initiatives as compared to the factor's group of "Governance support to implement SCO (GovF)". The established SCO model is the first that integrates all operations at the university, and highlights the importance for considering the governance support and accountability in analyzing and making decision of any potential initiatives towards campus sustainability. Hence, it can assist those involved in the planning of campus infrastructure and development to determine the most critical factors in implementing the SCO initiatives towards sustainability in Malaysian public universities.

ABSTRAK

Kebelakangan ini beberapa universiti di dunia telah melaksanakan pelbagai inisiatif bagi memastikan kampus mereka beroperasi secara mampan. Malangnya, inisiatif tersebut masih berbeza-beza dan tidak dilaksanakan secara sistematik di universiti. Beberapa model boleh dijadikan rujukan untuk membangun dan melaksanakan kemampanan di kampus. Namun begitu, adalah penting bagi universiti tempatan untuk memahami situasi semasa sama ada masih terdapat kelemahan untuk memenuhi syarat dan keperluan semua fasa model tersebut. Oleh kerana isu kemampanan di Malaysia masih baharu, perlaksanaannya di universiti harus dilakukan secara berperingkat mengikut keperluan dan keadaan universiti itu sendiri. Oleh itu, kajian ini memberi tumpuan kepada mengenalpasti inisiatif SCO yang relevan untuk dilaksanakan di universiti awam Malaysia, dan juga menentukan faktor kritikal tadbir urus yang mempengaruhi kejayaan perlaksanaan inisiatif SCO. Ia melibatkan pendekatan kuantitatif dengan menggunakan tinjauan soal selidik berstruktur, yang direka berdasarkan item yang diperolehi dari beberapa laman web universiti-univesiti mampan di dunia dan juga daripada kajian literatur. Borang tinjauan soal selidik diedarkan kepada enam puluh lapan responden terpilih di Pejabat Pembangunan atau Jabatan Lestari di universiti awam tempatan. Berdasarkan model perhubungan struktur, didapati bahawa kumpulan faktor “Akauntabiliti bagi meningkatkan prestasi SCO (AccF)” mempunyai impak tertinggi dan lebih penting dalam melaksanakan tiga belas inisiatif SCO berbanding dengan kumpulan faktor “Sokongan tadbir urus untuk melaksanakan SCO (GovF)”. Model SCO yang dibangunkan ini adalah yang pertama menggabungkan semua operasi di universiti, dan menekankan kepentingan untuk mempertimbangkan sokongan tadbir urus dan akauntabiliti dalam menganalisis dan membuat keputusan mengenai sebarang inisiatif berpotensi kearah kemampanan kampus. Oleh itu, ia dapat membantu mereka yang terlibat dalam perancangan infrastruktur dan pembangunan kampus untuk menentukan faktor yang paling kritikal dalam melaksanakan inisiatif SCO ke arah kemampanan di universiti awam di Malaysia.

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LIST OF NOMENCLATURE

AccF	Accountability to improve performance of SCO initiatives and Climate Initiative
AVE	Average Variance Extracted
BEMS	Building Energy Management System
C&D	Construction and Demolition
CAFM	Computer Aided Facilities Management
CB-SEM	Covariance-based SEM
CCM	Common Carbon Metric
CGSS	Centre for Global Sustainability Studies
CO_2	Carbon Dioxide
CR	Composite Reliability
CSAF	Campus Sustainability Assessment Framework
CSFs	Critical Success Factors
CSR	Corporate Social Responsibility
EMS	Environmental Management System
EPA	Environmental Protection Agency
ESD	Education for Sustainable Development
f^2	Effect size
GHG	Greenhouse Gas
GovF	Governance set up to implement SCO initiatives
GWU	George Washington University
HEIs	Higher Education Institutions
IARU	International Alliance of Research Universities
IBM	International Business Machines
KeTTHA	Ministry of Energy, Green Technology, and Water
KMO	Kaiser-Meyer-Olkin
Mr	Mean Score

N	Total number of respondents
PDCA	Plan-Do-Check-Act
PLS-SEM	Partial Least Squares-Structural Equation Modeling
Q^2 - value	Predictive relevance
R^2 - value	Coefficient of determination
SCO	Sustainable Campus Operations
SD	Standard Deviation
SEM	Structural Equation Modeling
SOV	Single Occupancy Vehicle
SPSS	Statistical Package for the Social Science
t - value	significant relationships between independent variables
TBL	Triple Bottom Line
UConn	University of Connecticut
UHI	Urban Heat Island
UI	University Indonesia
UKM	Universiti Kebangsaan Malaysia
ULSF	University Leaders for a Sustainable Future
UM	Universiti Malaya
UMP	Universiti Malaysia Pahang
UMS	Universiti Malaysia Sabah
UNEP-SBCI	United Nations Environment Programme's Sustainable Buildings
UNESCO	United Nations Educational, Scientific and Cultural Organization
UniMAP	University Malaysia Perlis
UPM	Universiti Putra Malaysia
USIM	Universiti Sains Islam Malaysia
USM	Universiti Sains Malaysia
UTAR	Universiti Tunku Abdul Rahman
UTeM	Universiti Teknikal Malaysia Melaka
UTHM	Universiti Tun Hussein Onn Malaysia
UTM	Universiti Teknologi Malaysia
UUM	Universiti Utara Malaysia
VOC_S	Volatile Organic Compounds
WCED	World Commission on Environment and Development
WUR	Wageningen University and Research

α - value	Cronbach's Alpha
β - value	Path coefficient

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The World Commission on Environment and Development (1987) used this definition of sustainable development in the report entitled Our Common Future. This report is also popularly known as Brundtland Report following the name of a Norwegian, Gro Harlem Brundtland, who chaired the commission. The purpose of this Brundtland report is to strengthen the global agenda for change, as well as to establish a framework to address the strategies necessary to achieve sustainable development. Sustainability is the practice of striving toward a better future, which includes; (i) improving human health and wellbeing, (ii) protecting and restoring the natural environment, and (iii) fostering a stronger economy and financial well-being for businesses, organizations, families, and individuals. These three parts are often called the triple bottom line (TBL), which means all measures taken must be beneficial to the environment, economy, and social as illustrated in Figure 1.1.

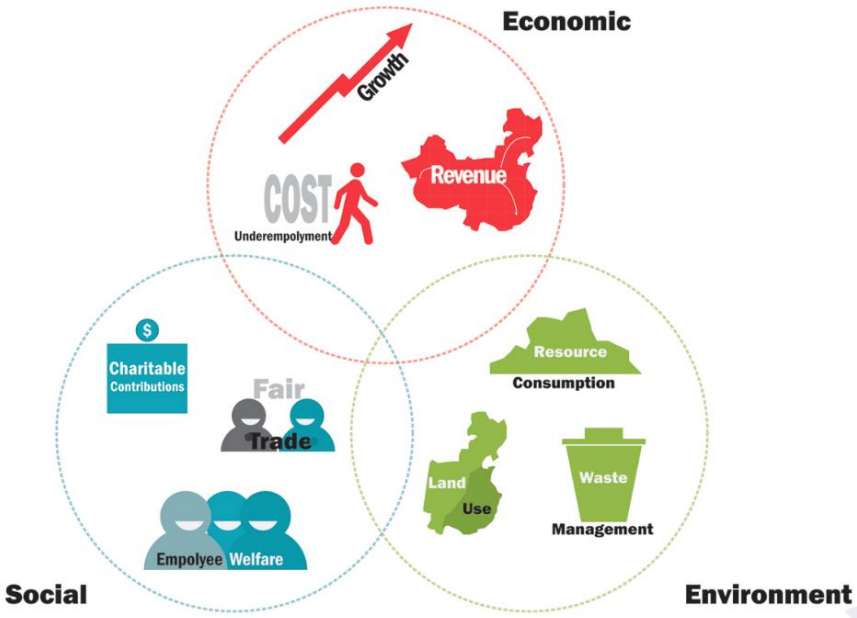

Figure 1.1: Triple Bottom Line for Sustainability
(Elkington, 2010)

Sustainability awareness on Higher Education Institutions (HEIs) started to arise among the public through an Earth Day celebration in 1970 when students buried an automobile to symbolize the deleterious impact of humans on the campus environment. It was then followed by energy crisis in 1970s that has led to greater awareness on environmental challenges. The environmental pollution and degradation caused by energy and material consumption is a side effect from various operations and activities on campus. Such activities cover teaching and learning, research and development, and provision of support services. Nowadays, it has become an issue at the global level and the concerns of policy makers and planner (Alshuwaikhat & Abubakar, 2008). Thus, the idea of sustainability is triggered as a result of consciousness of direct and indirect adverse effects to the environment due to such activities and operations at HEIs. Velazquez *et al*. (2006) define sustainable development for higher education as "a higher educational institution, as a whole or as a part, that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles".

In educating sustainability to the campus society, the United Nations Decade of Education for Sustainable Development (ESD) (2005-2014) has highlighted the potential to promote sustainable operations at higher institution level. Sustainable operations at HEIs can be in the form of energy efficiency, waste management, water conservation, green building design, transportation, foods production, and green procurement. According to Koichiro Matsuura, who was the Director General of United Nations Educational, Scientific and Cultural Organization (UNESCO) for the years 1999 to 2009, education in all its forms and at all levels not only to create awareness within the community but also one of the most powerful tools to bring the changes needed to achieve sustainable development (UNESCO, 2005).

Universities have the potential to give an impact on the environment, as they have a wide campus area with large population, and also carry out complex operations not only conducting various teaching and learning activities but also involving in research and development, publication, consultation, innovation, and commercialization. In their research study, Yarime & Tanaka (2012) found that the dimensions of governance and physical operations have been given more focus in assessing the sustainability of a university as compared to other areas of education, research, and outreach. Moreover, in year 1990, Talloires Declaration urged on universities to carry out more sustainable physical operations, as well as to become an example of environmental responsibility by establishing long-term sustainability policies, and embed the importance of environmental sustainability amongst their citizens. It is not surprising that most of the university's sustainability policies focus more on physical operations, and it is frequently mentioned in policy and being one of the main thrusts of campus sustainability initiatives (Wright, 2002). For example, Kyoto Declaration encourages universities to review their physical operations to reflect sustainable development practices. In addition, the Talloires Declaration also urges HEIs on providing an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations (ULSF, 2001). Both declarations are often referred by HEIs in developing and implementing SCO initiatives through centralized programs to promote green practices in achieving campus sustainability objectives.

Since university can be particularly well suited for the realization of sustainable development, it should provide a safe environment, ecological balance, and intergenerational equity that is compatible to the development, as it is a place to create professions and professionals. Perhaps, and most obvious, universities around the world can make a difference in education system, and these future citizens and leaders will play a critical role in helping us to move towards a more sustainable future. There are universities that incorporate all academics activities in their sustainable education, add students' learning skills for sustainability within their coursework, and also incorporate sustainable practices through their professional staff as they play their roles as managers and operational contexts.

1.1.1 Model of Sustainable Campus

Given that sustainability issues are complex, it is imperative that Education for Sustainable Development (ESD) pursues an integrated approach in modeling sustainability in the core functions and systems of the university. Sustainable campus model is often used to provide an idea of how the campus sustainability can be achieved in a holistic and integrated way. In this section, six well known sustainable university models will be discussed.

One of the earliest models, which was proposed by Weenen (2000), is sustainable university classification model, as illustrated in Figure 1.2. The model has looked into the issue of sustainability in higher education through three angles in order to answer the questions of, (i) Why should we be involved? (ii) What can we do?, and (iii) How would we be organized? (Weenen, 2000). The proposed questions are answered separately in different axes and at different levels. For example, the question of "what can we do" is answered in 'Engagement' axis (i.e. y-axis). It expresses the primary approach for any organization is the operation of sustainable campus. The second level emphasizes research activities and education programs focusing on the campus operation. At the third level, this educational organization reformulates and influences the university management to establish a relevant policy. At the end, the policy will be adopted and incorporated in the university mission. The other two axes would have similar explanations with regard to their respective questions.

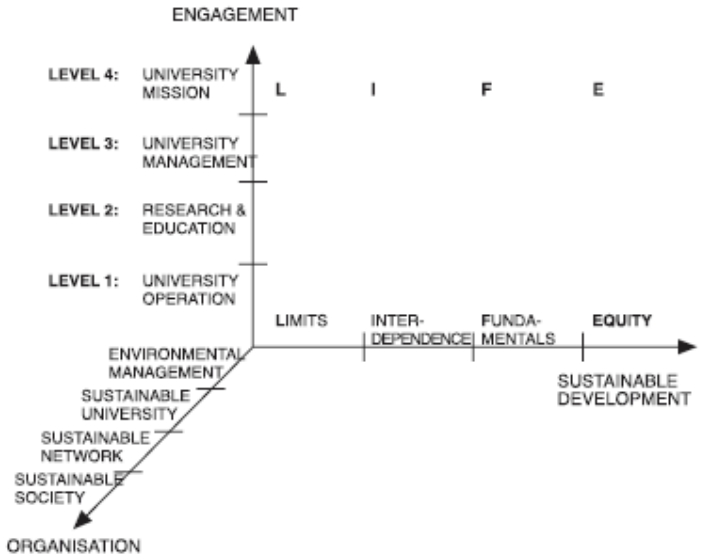

Figure 1.2: Sustainable University Classification Model

(Weenen, 2000)

Meanwhile, Cortese (2003) has proposed another model as exhibited in Figure 1.3, which is higher education modeling of sustainability as a fully integrated system. This model illustrates that all parts of the university system and activities such as teaching, research, operations, and relations with local communities should be interlinked with one another. It seems that the activities are critical to achieving a transformational change, thus it can only occur by connecting them to each other. Briefly, these four elements have a specific role and have a significant relationship to each other in achieving a sustainable campus.

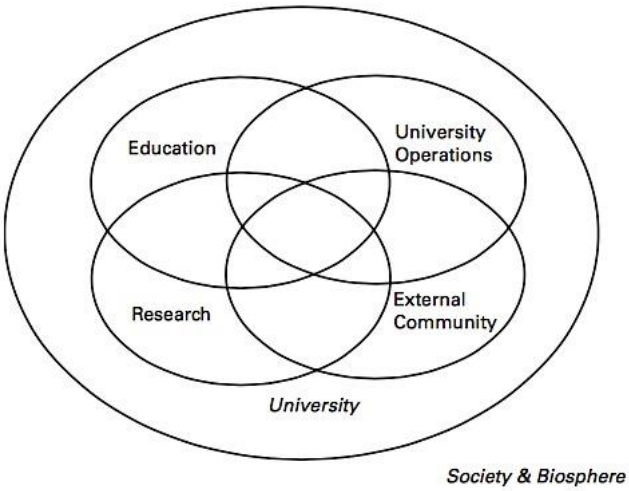

Figure 1.3: Higher Education Modeling of Sustainability as a Fully Integrated System

(Cortese, 2003)

Campus sustainability assessment framework model (CSAF) or popularly known as sustainable egg, which contains several different indicators, has been proposed by Cole (2003). He is an academician and researcher at the Royal Roads University, Canada. The model constitutes two major parameters, namely people and ecosystem, together with their respective indicators as shown in Figure 1.4. Ecosystem indicators include air, water, land (i.e. space and planning), waste, and energy. Whereas, people indicators comprise knowledge, community, governance, economy, and wealth. The structure of CSAF is based on the ten (10) main indicators and broken down further into one-hundred and sixty-nine (169) sub indicators, to assess an educational institute. CSAF is also used as a standardized audit tool for Canadian campuses. Since this model has been designed for Canadian universities, the applicability of this tool for universities in other countries is doubtful (Beringer, 2006). Even some universities in Canada are unable to find information regarding indicators contained in CSAF.

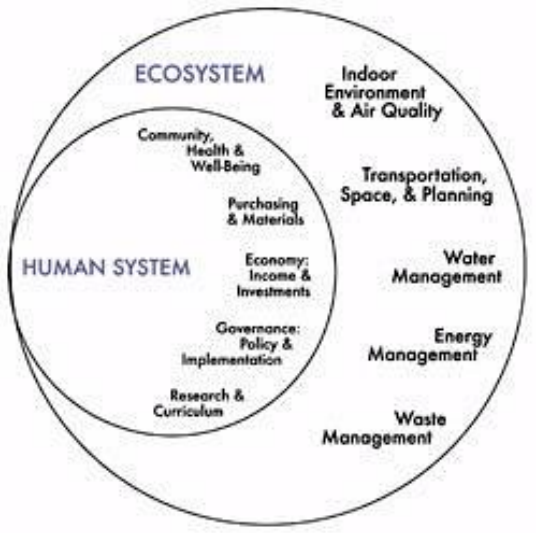

Figure 1.4: Campus Sustainability Assessment Framework Model or Sustainable Egg (Cole, 2003)

Figure 1.5 shows the structure of the Plan-Do-Check-Act (PDCA) model of sustainable university as proposed by Velazquez *et al*. (2006). It consists of four (4) phases, which systematically exhibits concept of sustainability into vison and mission of university, as well as strengthening the policy and strategies for fostering sustainability into the four core businesses of university comprising education, research, outreach and partnership, and sustainability on campus. This model emphasizes that sustainability initiatives must be based on a continuous improvement. The PDCA cycle is a useful tool to coordinate continuous improvement efforts. This is a management philosophy that seeks improvements as a never-ending process of achieving small improvements.

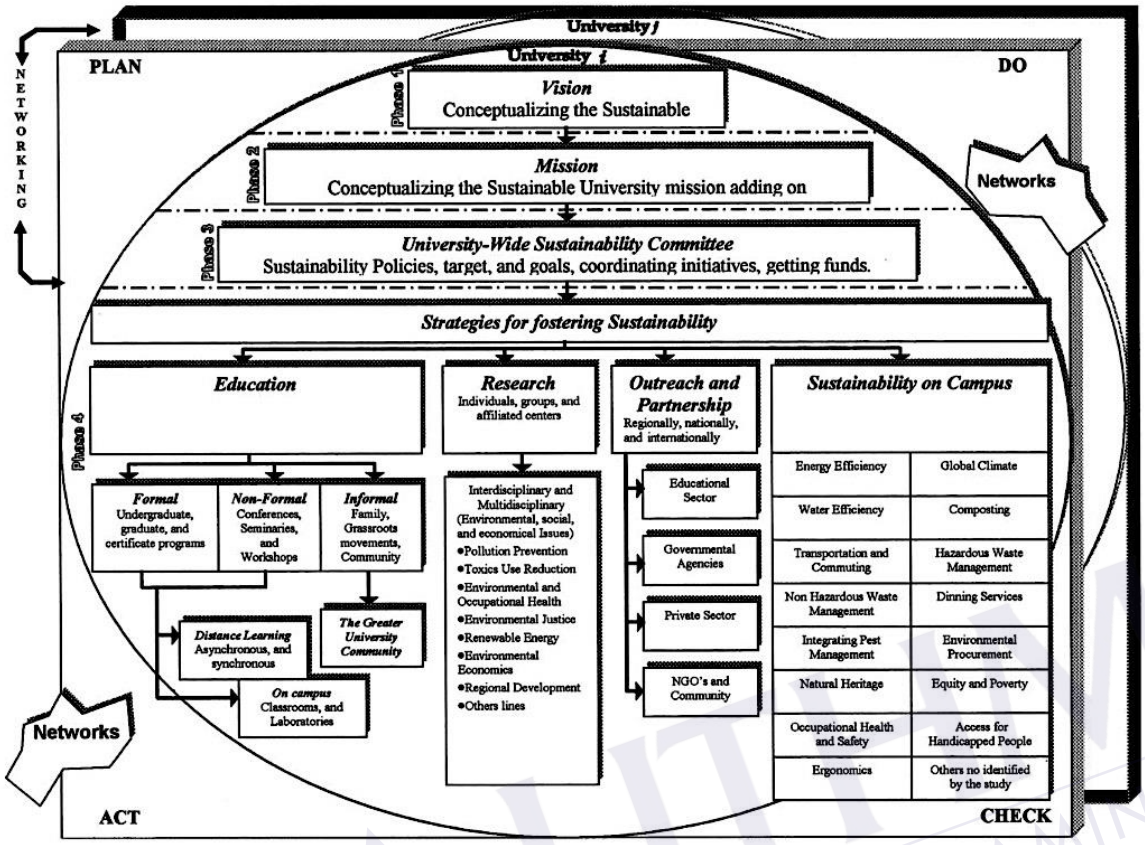

Figure 1.5: PDCA Model of Sustainable University
(Velazquez *et al*., 2006)

Not much difference from the previous model proposed by Velazquez *et al*. (2006), Alshuwaikhat & Abubakar (2008) stressed that in order to promote campus sustainability, a university should have a clear vision and serious commitment from top management towards implementing sustainability initiatives. The implementation of sustainability approach becomes easier with the establishment of an organizational structure through either a department or a committee, and also the provision of necessary resources to achieve the sustainability vision. Alshuwaikhat & Abubakar (2008) have proposed the framework of approach to achieving campus sustainability, as presented in Figure 1.6, which adopts three main strategies, namely Environmental Management System (EMS) implementation, public participation and social responsibility, and sustainability teaching and research, in an integrated way. Each strategy has specific initiatives that could lead to achieving the sustainability mission of a university.

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