

Web Content Analysis On Sustainable Campus Operation (SCO) Initiatives

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Abstract. The purpose of this paper is to identify and analyse the current practices implemented in global universities for achieving sustainability throughout campus operations. This study adopted a web content analysis method where 30 international green universities' websites have been thoroughly examined to identify common initiatives implemented to achieve sustainability through campus operations. The findings are ranked based on the implementation of these initiatives by participating universities. From the websites reviewed, as much as 31 initiatives have been identified as common initiatives frequently implemented by green universities to achieve sustainability in campus operations. It was found that the common initiatives frequently implemented by most of the universities include 'Provide bin with clearly marked signs to increase the number of recycling items', and 'Generate electricity on campus by establishing power generation plants' with 87% and 83% respectively. This paper fills the gap by presenting the investigation of sustainability initiatives from some of the major green universities internationally. It is suggested that higher education institutions, particularly Malaysian universities, initiate or manage their implementation of sustainable campus operation (SCO) initiatives based on the findings of this research.

1 Introduction

Universities are generally known for their wide area with large population, and carrying out complex operations and activities which comprise various teaching and learning, research and development, and provision of support services. They can generate significant environmental impacts because of their huge use of energy, extensive transportation, massive waste, high consumption of materials, and extensive development of built facilities [1]. Most researchers believe that to overcome these issues, elements of campus sustainability should be incorporated into all aspects of university's governance, operation, education, research, and outreach [2][3][4][7][8]. However, dimensions of governance and operations have been given more focus in assessing the sustainability at university as compared to other areas [7].

In Malaysia, although there have been many campus sustainability initiatives being implemented by local universities to achieve Sustainable Campus Operations (SCO), it seems that the efforts are still divergent and not systematically applied. The knowledge on the current and actual campus sustainability practices is still limited as there is currently very few published articles provide in depth discussion on the conceptual or practical frameworks of campus sustainability [1]. Therefore, further studies are still needed in order to share information, understand the issues and concepts, and develop action plans to be used as guidelines that are appropriate to the local universities. This paper fills the gap by presenting the investigation of the real

sustainability practices from some major green universities in the world. Malaysian universities could use the findings whether to initiate or to manage their implementation of SCO-initiatives.

2 Sustainable Campus Operations Background

About 400 university leaders from over 52 countries have signed Talloires Declaration to show their commitment and support to environmental sustainability in Higher Education Institutions (HEIs) [9]. The declaration urges universities to carry out a more sustainable campus operations, as well as incorporating sustainability and environmental literacy within universities' approach as a whole by explicitly linking research, educational and operational activities. The universities should be the role model of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations [10]. Kyoto Declaration also encourages universities to review their operations to reflect the sustainable development practices. Both declarations are often referred by HEIs to develop and implement SCO through centralized programs to promote green practices in achieving campus sustainability objectives. It is not surprising that most of the university's sustainability policies and sustainability initiatives focus more on operations rather than other areas [11].

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Campus Operations is responsible for the provision of all buildings and facilities within universities to maintain a safe, comfortable and attractive campus environment that supports excellence in teaching, learning and research. Sustainable development benefits can be achieved through consuming fewer resources in construction and operation, reduce negative impacts on environment, using efficient building material energy, minimize construction waste, and reduce planning risk, extended building life and viability [5] [6].

In adopting sustainability in campus operations, various focus areas and goals are being set by universities around the world. Based on [7], campus operation and environmental performance are related to energy and water consumption, and waste and hazardous materials management. While, [12] mentioned that Environmental Management System (EMS) covers two areas, namely (i) environmental management and improvement, which relates to waste minimization, energy efficiency, and environmental conservation, and (ii) green campus, which aims to promote construction of green buildings and transportation facilities. Sustainable operations emphasize features such as saving, environmental quality, and efficiency and effectiveness of resources for university. For instant, the operations must be able to lower the carbon emission, as well as able to reduce the consumption of non-renewable sources, and the resources are selected based on life cycle assessment.

On a personal level, by doing recycling, limit energy use, buy products with low carbon footprints, and buy products from sustainable sources are the several methods adopted to go green. In turn, universities can do their bit too, such as developing their own sustainability policies and implementing the initiatives towards SCO. As universities are unique due to its topography, population size, culture and climate where they exist, and etc., therefore the selection of areas and initiatives that can be effectively conducted at a particular university are important to be identified.

3 Method

A total of 30 green universities have been identified as samples for this study. Table 1 outlines the list of universities obtained through Google search using several keywords including 'Campus Sustainability Initiatives', 'Campus Green Practices', 'Members of International Alliance of Research Universities (IARU)', 'University Listed in UI GreenMetric', and 'The 39 Greenest Universities'. The investigation of the websites is only focused on web menus and content of web pages consist of the campus operations practices or initiatives adopted at the universities. From the investigation of the 30 green universities' websites, as much as 31 initiatives have

been identified as common initiatives frequently implemented to achieve SCO.

4 Findings

Table 2 presents the findings of this study. Most of the green universities have implemented initiatives to achieve sustainability in campus operations by 'Provide bin with clearly marked signs to increase the number of recycling items' and 'Generating electricity in campus through a large-scale plants or power generation plants e.g. solar energy to reduce nonrenewable fuels'. The top 2 initiatives mentioned earlier can be considered as the most significant initiatives implemented by most of the international universities to achieve SCO with involvement percentages of 87% and 83%, respectively.

Including the two initiatives mentioned above, the top 5 list of initiatives that are frequently implemented by universities towards achieving SCO also consist of 'Design, build and renovate university buildings according to green building certification/standard/index', 'Collect food waste from dining halls and convert it into a high grade compost which can be used in the gardens and landscape in the campus', 'Use of energy efficient equipment and eco-friendly products in campus to enhance performance and to reduce carbon footprint' and 'Use unprocessed water supply such as portable water, rainwater harvesting or on-site recycling of water which can be used in operational activities and reduce the water bills'. Other implemented initiatives such as 'Providing secure bicycle storage area', 'Provide parking facilities for carpooling, bicycling and shuttle bus purpose', 'Providing safe cycling & walking paths', 'placing the bin at convenient place' and 'Buying foods from local producers to reduce the distance in transporting foods to consumer' are also among the significant initiatives frequently implemented on campus encompassing 60-80% of universities considered in this study.

However, several others; such as 'Create native and drought plants landscape as significantly reduced the need for irrigation and maintenance', 'Provide in-campus workshop to maintain and repair bicycles', 'Collect and process garden/landscape waste into compost for a campus gardening and landscape', 'Consider the full life-cycle of building from the extraction of resources during building construction, maintenance, demolition and material recycling during renovation' and 'Provide real time shuttle-bus schedules', are less adopted as only less than 40% of the green universities implemented such initiatives. Whereas, the only initiative that can be considered as insignificant is 'providing showers for cyclist' since it is rarely implemented by the green universities towards achieving SCO.

Table 1. Samples of Green Universities

Green Universities Identified	Search Key words				
	Campus Sustainability Initiatives	Campus Green Practices	Members of International Alliance of Research Universities (IARU)	Top 15 University Listed in UI Green Metric 2015	The 39 Greenest Universities of 2015
University of Nottingham [13]	X			X	
University College Cork [14]	X			X	
University of California, Davis [15]	X			X	
University of Oxford [16]	X		X	X	
University of Connecticut [17]	X			X	
Colorado State University [18]	X				X
Harvard University [19]	X				
Duke University [20]	X				
Thompson Rivers University [21]	X				
Bloomsburg University [22]	X				
Emory University [23]	X				X
Colgate University [24]	X				X
University of California, Berkeley [25]	X		X	X	
Cornell University [26]	X				X
University of Alberta [27]	X				
Gonzaga University [28]	X				
University of Massachusetts Amherst [29]	X	X			X
Lewis and Clark Institute [30]		X			
University of California, Irvine [31]		X			
Carnegie Mellon University [32]		X			
Australian National University [33]			X		
National University of Singapore [34]			X		
University of Cambridge [35]			X		
University of Cape Town [36]			X		
University of Copenhagen [37]			X		
Yale University [38]			X		
Northeastern University [39]				X	
University of Limerick [40]				X	
University of North Carolina [41]				X	X
University of Plymouth [42]				X	

Table 2. Ranking of SCO Initiatives

SCO-initiatives		30 green universities websites		
		Frequency	Percentage	Average
1) Energy				
E1	Generate electricity on campus by establishing large-scale plants or power generation plants such as solar energy systems to reduce/replace total consumption of nonrenewable fuels (e.g.: oil & natural gas)	25	83%	76.5%
E2	Use of energy efficient equipment and eco-friendly products within the campus to enhance performance and reduce carbon footprint	21	70%	
2) Building				
B3	Install building management systems to monitor real-time electricity, water and chilled-water usage	14	47%	52%
B4	Consider the full life-cycle of building from extraction of resources to demolition and recycling when building or renovating a building	11	37%	
B5	Design, build, and renovate building according to green certification standard	23	77%	
B6	Design the building for high performance	14	47%	

3) Green space				
G7	Reserve green area to reduce heat-island effect by provide effective shading, oxygen, and isolating carbon emissions generated by campus activities	17	57%	49%
G8	Create green area for storm water management to reduce the risk of flooding	15	50%	
G9	Create native and drought plants landscape as significantly reduced the need for irrigation and maintenance	12	40%	
4) Water				
Wr10	Use of water efficient equipment which have water conservation and water saving features	17	57%	63.5%
Wr11	Use unprocessed water supply such as portable water, rainwater harvesting or on-site recycling of water which can be used in operational activities	21	70%	
5) Purchasing & procurement				
P12	Establish central information medium or a portal to assembled materials for re-use or exchange	18	60%	55%
P13	Run programs for students or department to donate or sale unwanted items to local community and charities	13	43%	
P14	Set technical specifications or purchasing guidelines with include environmental preferable criteria	18	60%	
P15	Include procedures of treatment or proper handling of solid waste (inorganic waste), hazardous waste and sewage disposal, without polluting the environment and public health	17	57%	
6) Transport				
T16	Use renewable fuels such as bio-diesel or use of energy efficient vehicles such as hybrid or electric vehicle for university transportation (official vehicle or even bus)	17	57%	49.9%
T17	Offer staff and students to purchase public transport season tickets	18	60%	
T18	Provide real time shuttle-bus schedules	10	33%	
T19	Provide a centralized parking facilities for carpooling, bicycling, walking, and shuttle bus purpose	19	63%	
T20	Provide secure bicycle storage area	20	67%	
T21	Provide showers for cyclist	4	13%	
T22	Offer access to free or cheap bicycles or provide bicycle charter	16	53%	
T23	Provide safe cycling & walking paths	19	63%	
T24	Provide in-campus workshop to maintain and repair bicycles	12	40%	
7) Waste				
Ws25	Re-use or recycle construction and demolition waste (e.g.: unused metal, concrete, plywood etc.) in different project applications	13	43%	61.2%
Ws26	Provide bin with clearly marked signs to increase the number of recycling items	26	87%	
Ws27	Place the bin in areas both convenient and close to the waste source and allow easy access by the community members	19	63%	
Ws28	Collect and turned garden/landscaping waste into compost for re-used on campus gardens and landscape	12	40%	
Ws29	Collect food waste from dining halls and convert it into a high grade compost which can be used in the gardens and landscape in the campus	22	73%	
8) Food				
F30	Buying foods from local producers to reduce the distance that food is transported from product consumer	19	63%	61.5%
F31	Choose the agricultural products that using organic fertilizer or minimal chemical fertilizer	18	60%	

However, based on the average score of each element of SCO initiatives, it can be seen clearly from Table 2 that the Energy sector contributes the most initiatives implemented amongst the green universities with 76.5% followed by Water 63.5%, Foods 61.5% and Waste 61.2%. Meanwhile, element of Purchasing and Procurement has received less attention with only 55% of the initiatives implemented by the green universities as well as other elements of SCO initiatives including

Building area 52%, Transport 49.9%, and Green space 49%, respectively.

5 Conclusions and Recommendation

The concept of sustainable campus is relatively new in Malaysian, and several local public universities are still at the infant stage in adopting and implementing the SCO initiatives towards sustainability. Obviously, the planning and implementation of these initiatives should be phased

and prioritized accordingly so that they can affect optimally on sustainability in campus operations.

There are various initiatives and sustainable practices that can be adopted and implemented by the top management to ensure that universities operate in a sustainable manner. However, more focus and attention should be given to the initiatives that can give positive impact on the environment, economic and social aspects of the campus community. In the early stages, the local universities may implement only the top 5 lists (e.g. Provide bin with clearly marked, Generating electricity in campus through power generation plants, Design, build and renovate building according to green building certification/standard/index, Compost foods wastes, and Use of energy efficient equipment and eco-friendly products) to ensure more focused and manageable implementation of the initiatives for successful results. Otherwise, top management can also implement sustainability initiatives according to the focus areas such as energy and water sectors, as this focus area can give greater impact on sustainable development at the university although it requires higher initial investment for a long term benefits.

However, it is not denying that factors such as self-awareness, knowledge, finance, leadership, organization, technology, climate, and etc. also affect the selection of sustainability initiatives to be implemented. The initiatives discussed earlier are for reference purposes only and unnecessarily be implemented fully by local universities. Finally, the SCO initiatives identified from website review will be considered for further investigation on their level of significance through questionnaire survey should they be implemented at Malaysian universities.

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