

Sustainable Education: An Assessment of Carbon Footprint at UCSI University and Proposed Green Campus Initiative Framework

Keoy Kay Hooi¹⁺, Padzil Hassan² and Nari Am Jami³

¹keoykh@ucsi.edu.my ³nari.amjami@gmail.com

Centre of Excellence for Research, Value Innovation and Entrepreneurship (CERVIE)

UCSI University, UCSI Heights, 56000 Cheras, 56000 Kuala Lumpur Malaysia

²padzil037@salam.uitm.edu.my

Centre for Construction Project & Infrastructure Management (CPIM), Faculty of Architecture, Planning and
Surveying

Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan Malaysia

Abstract. Researchers acknowledge mixture impact on the higher education institution's role over green initiative. Higher education institutions are stable, with the long-term thinking, obtain research and have educative goals which are enable them to educate about sustainability. Higher education institutions successfully combined local and global knowledge with the merging of the faculty, students and staffs talents to create synergies to develop new solutions. On the other hand, working within higher education institutions also has limitations. The time constrain often limit the students to be involved in short-term projects. Furthermore, the nature of hierarchical and bureaucratic structure of university's administration and management creates difficulty in instituting comprehensive approaches addressing campus sustainability. As the interest of green business sustainability is generating a lot of interests in the higher education institution, this paper evaluates the implementation of Green Campus Initiative (GCI) at the UCSI University Malaysia by evaluating their carbon footprint emission. The carbon footprint calculation and proposed framework presented in this paper aims to encourage other higher Education Institutions in Malaysia to implement the GCI. In order to reduce the environmental impact at UCSI University, the measurement of the CO₂ emission was a very important starting point. These primary data were processed with the formulas had been developed earlier and resulted the total carbon footprint produced by UCSI University in one year. Supported by the secondary data (i.e. literature review), a proposed framework of GCI implementation was proposed to be tested and empirically validated in future studies. It is hope that result obtained from this paper will provide guidelines for policy maker and management of the universities to acknowledge the importance of GCI to create a sustainable and profitable business application.

Keywords: green campus initiatives, carbon footprint, performance, Corporate Social Responsibility (CSR)

+ Corresponding author. Tel.: (+603) 9101 8880
E-mail address: keoykh@ucsi.edu.my

1. Introduction

According to Roy, et al. (2008), there are two main issues in environmental programmes for the Higher Education (HE) which is to reduce energy consumption and waste on campuses, and on “greening the curriculum”. One of the best way to reduce the environmental impact is by home-based and distance learning, including e-learning courses which is provided online via internet. The environmental impacts become possible to be reduced because distance learning eliminates or reduces the infrastructure and activities that used in conventional learning. The students and staffs fuel consumption can be reduced because they do not need to travel to the campus, and also the reduction of student’s accommodation, libraries and laboratories.

The subject of the provision of environmentally friendly building and CSR in the Malaysian higher education industry may be a new subject, but this has been in place in the developed countries for over the last few decades. In the face of the global competition, this will ultimately be one of the pre-requisites for a competitive industry. Initiative by UCSI University to evaluate carbon emission initiated in September 2008 with the simple objective to reduce the environmental impact caused by its business operations. The initiative is now the core component of the University’s Strategic Plan to provide basic ideas, analysis, and action plans to undertake a University Wide Greening Initiative. The common reasons in promoting the GCI and transition to more sustainable campus can be evident by the climate change concern as one of the interest in the environmental, and also the benefits to human health that will affect the financial benefits as the result of “greening” the educational building and environment (Woolliams et al., 2005).

2. Green Campus Initiative

According to Owens and Halfacre-Hitchcock (2006), several researchers acknowledge positive and negative aspects of the higher education institution’s role over green initiative. Higher Education (HE) institutions are stable, with the long-term thinking, obtain research and have educative goals which enable them to educate about sustainability. HE institute successfully combined local and global knowledge merge with the faculty, students and staffs talents to create synergies to develop new solutions. On the other hand, working within HE institute also has limitations. The time constrain often limit the students to be involved in short-term projects. The study of environmental impacts of HE was conducted because it is a fast growing service sector. This sector is a growing, consumer of energy and resources and generator of emission and waste. Total energy used of the UK HE building stock in 2002/2003 was 7.4 TWh, which is equals to 1.6 percent of UK’s industrial, commercial and public sector energy (Roy et al., 2008).

Sanusi and Khelghat-Doost (2008, p.488): further stated that ‘Education for Sustainable Development (ESD) also enables people to develop the knowledge, value and skills to participate in decisions about the way we do things, individually and collectively, locally and globally, that will improve the quality of life now without damaging the future of the planet. As such, institutions of higher learning will undoubtedly contribute greatly to this process.’ It is clear that the role of higher education institution is crucial in implementing the ESD principles because it is the place to educate young generation who will be leader in the future. The other role of higher education institution is to insert ESD principles in their strategic management as part of their responsibility to the society and achieve a sustainable recognition. The greater experience in the university’s energy conservation efforts lead to the recognition that more attention needed to be given to the occupant behaviour as a comprehensive energy reduction effort rather than just energy audits and system upgrades (Marans and Edelstein, 2010).

3. Carbon Footprint Assessment of UCSI University’s 2008 CO2 Emission

The concept of UCSI University GCI was prepared by the Corporate Affairs Teams to present a proposal that will be implemented in the aim to reduce the environmental impact caused by UCSI University’s business operations. The concept provided basic ideas, analysis, data and action plans to undertake a university’s greening initiative. The figure below shows the methodology used to collect data and determine the total carbon footprint for the year 2008.

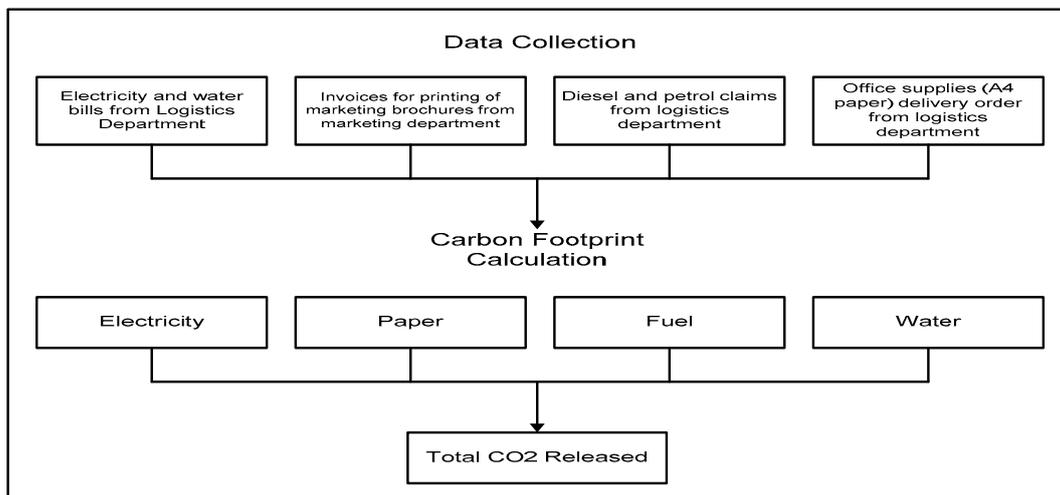


Fig. 1 UCSI University's carbon footprint measurement methodology

Carbon footprint is a measure of the exclusive total amount of CO₂ emissions that is direct and indirectly caused by an activity or is accumulated over the life stage of a product (Wiedmann and Minx, 2007). The CO₂ emission at UCSI University comes mainly from the use of electricity, fuel, paper and water. These four resources (see figure 1) cause a significant environmental impact that required attention. The electricity generation process which is using oil and natural gas results carbon monoxide (CO) and carbon dioxide (CO₂) as well as the gas produced by the fuel combustion. CO and CO₂ gas are considered as toxic and can cause green house effect if release excessively into the air. This is the main reason of using these four factors as a measurement.

In order to reduce the environmental impact at UCSI University, the measurement of the CO₂ emission was a very important starting point. The carbon footprint for the year 2008 was calculated using the formulas detailed in Table 1. The carbon footprint formula for the water is not available and there is no CO₂ release from water used at UCSI University.

Variables	Carbon Footprint Formula	Notes
Electricity	CO ₂ = AME x EEF <ul style="list-style-type: none"> ▪ AME: Average Monthly Electricity used (kWh) ▪ EEF: Electricity Emission Factor (CO₂e/kWh) 	It is better to use the average EEF of West Malaysia 0.585 CO ₂ e/mWh
Fuel	CO ₂ = AMF x FEF <ul style="list-style-type: none"> ▪ AMF: Average Monthly Fuel used (Liters) ▪ FEF: Fuel Emission Factor (CO₂e/Liters) 	<ul style="list-style-type: none"> ▪ Every liter of gasoline burnt releases 2.5 kg of CO₂. ▪ Every liter of diesel releases 2.85 kg of CO₂.
Paper	CO ₂ = AMP x PEF <ul style="list-style-type: none"> ▪ AMP: Average Monthly Paper used (Kg) ▪ PEF: Paper Emission Factor (CO₂e/Kg) 	<ul style="list-style-type: none"> ▪ 1 Kg of virgin paper produces 3.24 Kg of CO₂. ▪ 1 Kg of recycle paper produces 1.76 Kg of CO₂. ▪ The weight of one A4 standard paper is 5 gram.
Water	N/A	N/A

Table 1. Carbon footprint measurement formula

The data used to calculate the total carbon footprint produced by UCSI University was collected from Logistics and Marketing Department. The primary data collected includes electricity, fuel, and water bills. Also the invoices for printing the marketing and advertisement tools as the data source for paper used. Table 2 shows that, on an average, UCSI University uses 280,805 kWh of electricity per month in the South Wing Kuala Lumpur (KL) Campus alone. This releases an estimated 150 ton of CO₂ monthly (see figure 2). It takes an estimated 1,000 trees to offset the release of UCSI's CO₂ emission with clean oxygen. Of this usage, nearly half the amount is used for the air-conditioning system. Both the North Wing and South Wing KL Campus of UCSI University utilize 800 reams of white A4 paper a month. This is equivalent to 1600kg of paper or 18 trees and causes the emission of an estimated 5 tons of CO₂/month as can be seen in Table 2.

Resource	Average Monthly Use
Electricity	280,805 kWh
Transport Fuel	<ul style="list-style-type: none"> ▪ Diesel: 15660.96 liters ▪ Staffs and students mileage: 320,000 Km
A4 Cut Paper	16000 Kg

Water	4338.20 litres
--------------	----------------

Table 2. UCSI University's resources usage

This figure does not yet include the use of other paper materials such as envelopes, notepads, brochures etc. UCSI University's fleet of diesel vehicles used an estimated 3132.192 liters/month, which causes the emission of an estimated 8.2 tons of CO₂ per month. An estimated 800 vehicles commute to UCSI KL Campus daily. Assuming that on an average, each staff & student will need to travel 20km daily, this amounts to a cumulative total of 16,000km a day or 320,000 km a month (excluding Saturday and Sunday). This give an estimated CO₂ released of 71.5 tons a month.

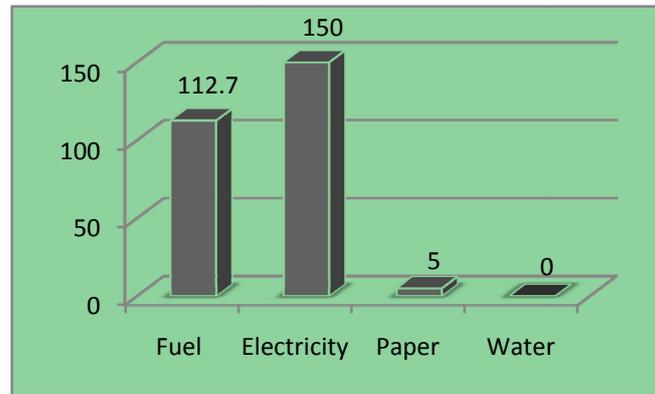


Fig. 2 UCSI University's monthly CO₂ emission

4. GCI: Proposed Framework

The proposed framework for the next phase of this research will be based on the process flow as in Figure 3 below. The success of Sustainable Performance Measurement (SPM) will be determined with the integration of strategic planning and day-to-day operations (Jamali, 2006). The flow started with the inputs which are strategic and operational level that will develop the socio cultural behaviour. This factor is the initial planning of the sustainable concept that will determine the strategic level of the organization. The combination of strategic level and operational level will determine the success of GCI.

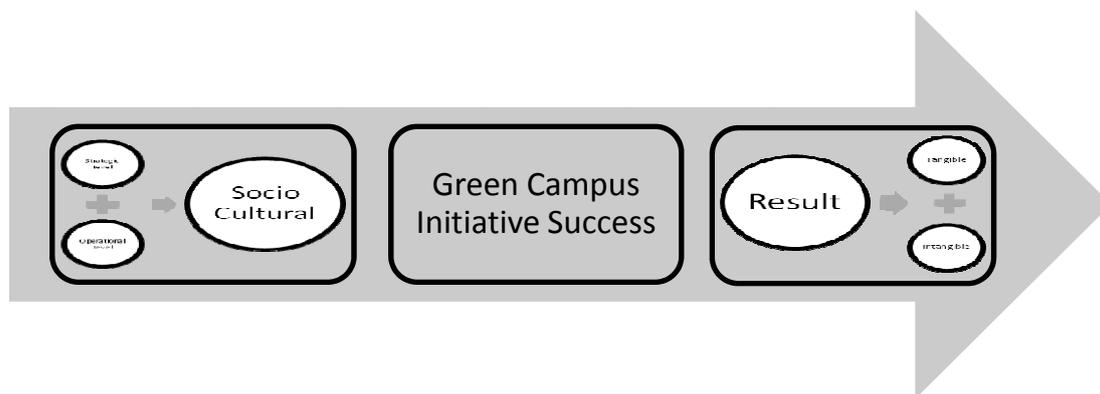


Fig. 3 Green Campus Initiative Process Flow

From the process flow diagram above (figure 3), then we are purposing a framework for the implementation of GCI as can be seen in Figure 4. Based on the framework, the success of GCI influenced by many factors. From the strategic level, the factors will be economic viability, assets optimization, and sustainable business opportunities. This strategic level will come from top management in an organization, and will become the core concept of the whole implementation of GCI programmes. The concept and understanding of this strategy not only need to be known and applied by the top management, but need to be spread to the entire organization's part.

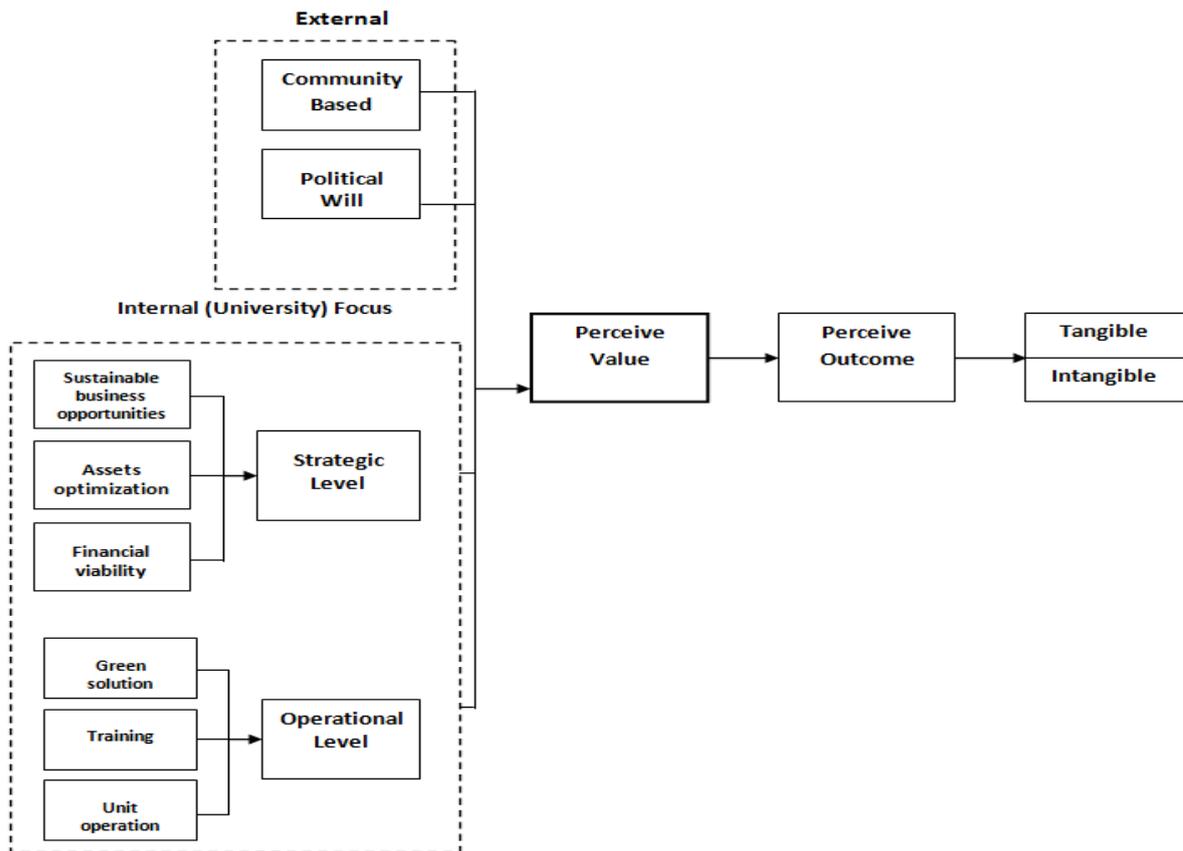


Fig. 4 Proposed GCI Framework

The execution of concept developed in the strategic level will be in the operational level which all the necessary things for the success of GCI will be done in this level. There are some factors in the operational level which are green solution, unit training and unit operation. These strategic and operational factors will determine the socio cultural factor as the intermediary factor. The success of GCI concept and implementation will also be influenced by drivers and barriers. The impact of each driver and barrier will be examined later in the questionnaire. The output or result of this concept will be tangible and intangible.

5. Conclusion

The green campus program provides a legitimacy to the environmental education programmes that will assist staffs and students in getting the sustainability initiatives. In order to make UCSI University a Green campus, various initiatives and actions are being taken. As far as CO₂ emission is concerned, UCSI University has started to reduce the use of resource that has been presented earlier, mainly electricity, fuel and paper. The carbon footprint measurement is an important starting point.

Green initiatives are challenging and require determination and a long-term commitment on the part of the entire campus community. These efforts, however, can yield significant paybacks such as environmental and economic sustainability, reputation as a leader through example, economic benefits and improved quality of life on campus. UCSI University and others academic institutions can play a critical role in shaping the mindset of the young generation to be environmentally-conscious. Future research will investigate the following objectives:

1. To identify the current trends of Green Campus Initiatives at Malaysian Higher Education Institution
2. To identify the critical factors of successful implementation of GCI from the perspective of strategic, operational and external factors
3. To develop a framework of Green University Index framework
4. To empirical test and validate the framework through mixed methods approach

6. References

- [1] CONWAY, T. M., DALTON, C., LOO, J. & BENAKOUN, L. 2008. Developing ecological footprint scenarios on university campuses: A case study of the University of Toronto at Mississauga. *International Journal of Sustainability in Higher Education*, 9, 4-20.
- [2] FISHER, R. M. 2003. Applying ISO 14001 as a business tool for campus sustainability: A case study from New Zealand. *International Journal of Sustainability in Higher Education*, 4, 138-150.
- [3] JAMALI, D. 2006. Insights into triple bottom line integration from a learning organization perspective. *Business Process Management JOURNAL OF BUSINESS STRATEGY*, 12, 809-821.
- [4] MARANS, R. W. & EDELSTEIN, J. Y. 2010. The human dimension of energy conservation and sustainability: A case study of the University of Michigan's energy conservation program. *International Journal of Sustainability in Higher Education*, 11, 6-18.
- [5] OWENS, K. A. & HALFACRE-HITCHCOCK, A. 2006. As green as we think? The case of the College of Charleston green building initiative. *International Journal of Sustainability in Higher Education*, 7, 114-128.
- [6] ROY, R., POTTER, S. & YARROW, K. 2008. Designing low carbon higher education systems Environmental impacts of campus and distance learning systems. *International Journal of Sustainability in Higher Education*, 9, 116-130.
- [7] SANUSI, Z. A. & KHELGHAT-DOOST, H. 2008. Regional centre of expertise as transformational platform for sustainability: A case study of University Sains Malaysia, Penang. *International Journal of Sustainability in Higher Education*, 9, 487-497.
- [8] WIEDMANN, T. & MINX, J. 2007. A Definition of 'Carbon Footprint'. C. C. Pertsova, *Ecological Economics Research Trends*, Chapter 1, 1-11.
- [9] WOOLLIAMS, J., LLOYD, M. & SPENGLER, J. D. 2005. The case for sustainable laboratories: first steps at Harvard University. *International Journal of Sustainability in Higher Education*, 6, 363-382.
- [10] WRIGHT, T. S. A. 2006. Giving 'teeth' to an environmental policy: a Delphi study at Dalhousie University. *Journal of Cleaner Production*, 14, 761-768.