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## Analysis of Sustainability Assessment Tools (SATs) for Higher Education Institutions (HEIs)

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### Abstract

During the last few years, there are many sustainability assessment tools (SATs) were developed and introduced to higher education institutions (HEIs) that functions to guide and assess the commitment of HEIs to implement sustainability. The aim of this study is to review and analysis four existing SATs namely as Sustainability Tracking, Assessment and Rating System (STARS), Campus Sustainability Assessment Framework (CSAF), UI GreenMetric Ranking and Sustainable Assessment Questionnaire (SAQ) which have been embedded and used as their sustainability guidance by many institutions in the world. The analysis is conducted by reviewing the indicators contained within the SATs and then the indicators will be gathered according 1) to the aspect of sustainability; environment, social and economics and 2) between the key elements of each SAT. Result found that there were a significant imbalanced proportion of indicators between the aspect of sustainability and between the key elements of sustainability among the sustainability assessment tools.

**Keywords:** Sustainability, Sustainable Development, Sustainability Assessment Tools, Higher Education, Sustainability Indicators.

### Introduction

In 1975, for the first time the UNESCO-UNEP International Environmental Education Programme had introduced about the concept of sustainability in the education and international level. This programme was managed and organized by the United National Educational, Scientific and Cultural Organization (UNESCO) and United Nation Environmental Programme (UNEP) (UNESCO, 1984). The issues of sustainability especially in higher education has been discussed through many international declarations such as Tbilisi declaration in 1977, Tallories decalaration in 1990, Haliffax declaration in 1991 and many more.

Since the development of the declarations in 1990s many sustainability assessment tools (SATs) have been developed and introduced to assess the level of sustainability initiatives in HEIs with different themes and indicators and methodology of assessments. Nixon (2002) highlighted that there are three main objectives of developing SATs that includes [i]identifying areas and [ii]developing strategies for campus to improve their sustainability performances and [iii]to foster

sustainability culture to implement sustainability. The development of SATs also should identify the important issues, can be measured and comparable, comprehensibility and contain more themes other than eco-efficiency (Shirberg, 2002).

There are several issues involving sustainability assessment tools (SATs) as highlighted by several scholars. Shriberg (2002) who analysed 11 cross institutional sustainability assessment tools (SATs) found that the SATs are greatly vary in terms of purpose, scope, function and development. The study also found that most SATs emphasized more on environmental or eco-efficiency factors such as decreasing of energy, water and other materials input rather on the need of functional areas.

Additionally Yarime and Tanaka (2012) also studied 16 tools of SATs and found that the overall percentage of the tool indicators are 44% in operation, 39% in governance and 8% in education. Besides that, there are several other key elements of sustainability found from the study such as curriculum, local community and research projects. Furthermore Fischer et. al (2015) studied 12 sustainability tools and found that most of the tools contained 67% in operation elements and 18% in education elements. The study highlights that the highest numbers of indicators from the 12 tools are from the physical resources and institutionalization then followed by education, curriculum, human resource and research.

Apart from that, Berzosa et. al (2017) compares the findings of four studies related to SATs analysis by Cole (2003), Shirberg (2012), Yarime and Tanaka (2012) and Fischer et. al (2015). Based on their analysis, it can be concluded that most of SATs contains different criterias and elements of sustainability. Berzosa et. al (2017) concludes that, it is important for HEIs to understand the concept of sustainability and more studies should be done to analyse the sustainability assessment tools before implementing them within the campus.

The element of sustainability should fulfill the aspects of environment, economics and social (Elkington, 2004) and focusing on a balance of the three aspects (Brundtland, 1987). The word sustainability is famously defined as *"development that meets the needs of the present without compromising the ability of future generations to meet their needs"* (Brundtland, 1987). Lozano (2009) defines sustainability as a holistic and interconnected phenomenon of economics, environmental and social dimension. AASHE (2014) refers sustainability as a concept that embraces environmental security, intra-generational and inter-generational equity, economic betterment and social and environmental justice. Hence, it can be concluded that the whole aspect of sustainability consists of environment, social and economics which followed the description of sustainability by Elkington (2004) who refers sustainability as three bottom lines of 3P; Planet (Environment), Profit (Economic) and People (Social) as shown in Figure 1.0.

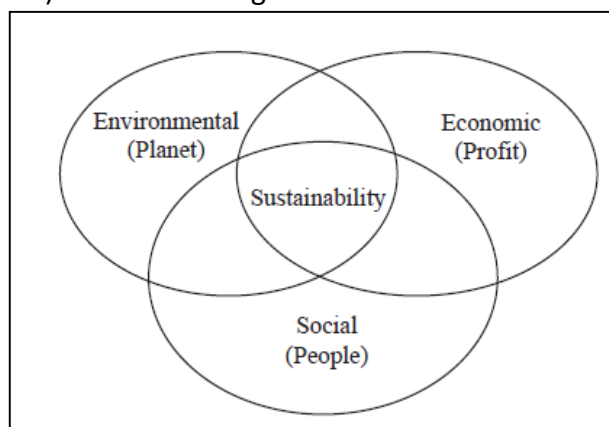


Figure 1 :- The three bottom lines of sustainability; Planet, Profit and People (Elkington, 2004).

Besides there are many sustainability models that were developed and serve as guidance to HEIs to practice and implement sustainability that proposed several themes or elements of sustainability in HEIs such as Cortese (2003), Velazquez et. al (2005), Gomez et. al (2015) and many more. A study by Husaini and Jusoh (2017) on several models of sustainability in higher education institutions (HEIs) found that there are several themes or elements of sustainability involving HEIs such as education, research, operation, campus engagement and reporting and assessment. A study conducted by Velazquez, (2005) describes sustainability activities in universities refers to environment, economics and social concerns and should minimize the negative environmental, economic, social and health effects generated in the use of their resources.

As conclusion, the concept of sustainability consists of three main aspects; environment, economics and social. There are also several elements of sustainability that should be emphasized among HEIs which include the element of education, research, campus operation, community engagement and reporting. These are the factors that play a vital role in developing a sustainable university. Lozano et. al (2015) who reviews several literatures also highlights seven sustainability initiatives which are education, research, campus operation, outreach, on-campus experience, assessment and reporting and institutional framework. Thus, it is important of this study to review and analyse the indicators in sustainability assessment tools (SATs) and investigate the indicators allocation within the concept of sustainability and between the key elements of sustainability.

### **Research Objective**

The objective of this paper is to review and analysis four sustainability assessment tools (SATs) for higher education institutions based on their percentage of elements and indicators.

### **Research Questions**

1. What is the percentage of indicators in sustainability assessment tools (SATs) allocated in each aspects of sustainability; economy, environment and social?
2. What is the percentage of indicators in sustainability assessment tools (SATs) allocated in each of their elements?

### **Literature Review**

#### **Sustainable Assessment Tools (SATs)**

This study is to review four existing sustainable assessment tools (SAT); Sustainability Tracking, Assessment and Rating System (STARS), Campus Sustainability Assessment Framework (CSAF), UI GreenMetric Ranking and Sustainable Assessment Questionnaire (SAQ). These four tools have been embedded by many HEIs around the world includes from the west and the east. Some these SATs have their reputation and they developed their own ranking system. Each of SATs contain different of kind of elements and indicators to monitor and assess the sustainability performances among HEIs. These four tools are described in detail in the following section.

#### **Sustainability Tracking, Assessment & Rating System (STARS)**

STARS refer to Sustainability Tracking, Assessment & Rating System which is coordinated under the association for the advancement of sustainability in higher education or known as AASHE. AASHE is an association of colleges and universities in United States and Canada and was founded in 2006 (AASHE, 2010). STARS is a sustainability self-reporting system that measure the progress of

sustainability for colleges and university. It is also known as one of the best comprehensive measuring tools for higher education institutions. There are four main areas of initiatives covers in STARS; education and research, operation, planning, administration and engagement (POE) and innovation (Yu-ti et. al, 2014). The overall framework of STARS is shown in Figure 2.0-

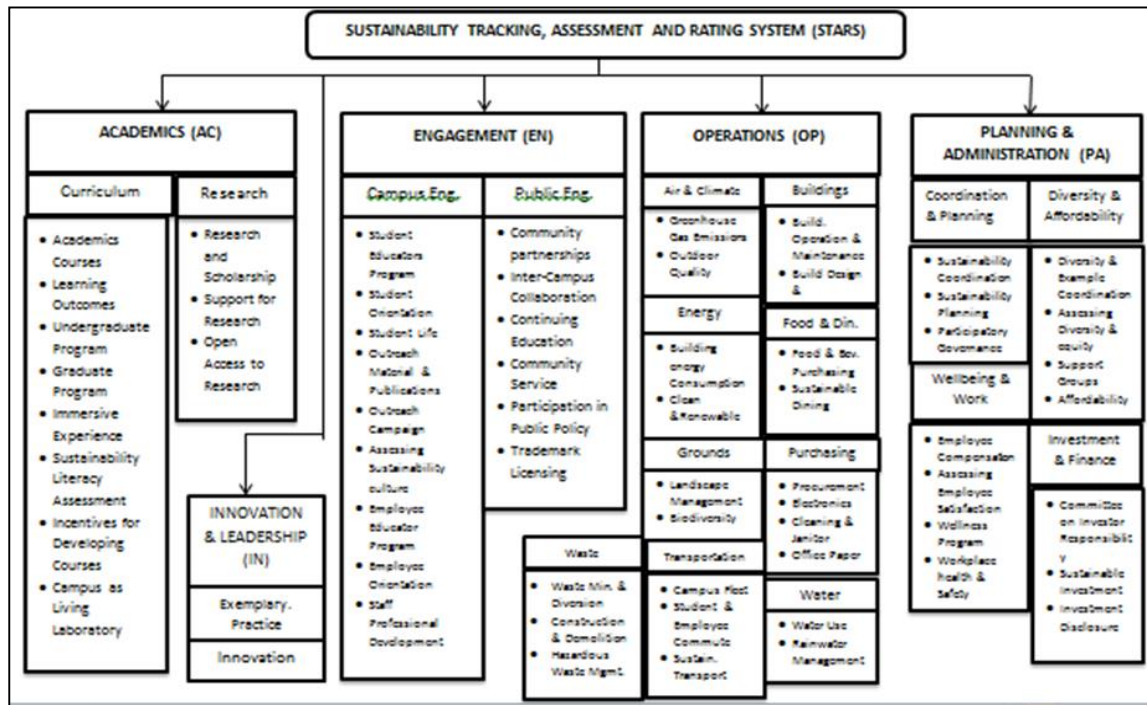


Figure 2:- Sustainability Tracking, Assessment & Rating System (STARS) framework (AASHE, 2011)

### Campus Sustainability Assessment Framework (CASF)

CASF refers to campus sustainability assessment framework which was developed by Lindsay Cole in her master thesis with the assistance of 15 other researchers in 2003. This framework is divided into two main area of assessment; ecological factor and people factor. The tool consists of ten elements of initiatives with a total 170 indicators. The ten main elements are divided into 1) Ecological;- land, air, water, energy and material and 2) People;- community, governance, knowledge, health and well-being and economy (Cole, 2003). The full framework of CASF is shown in Figure 3.0.



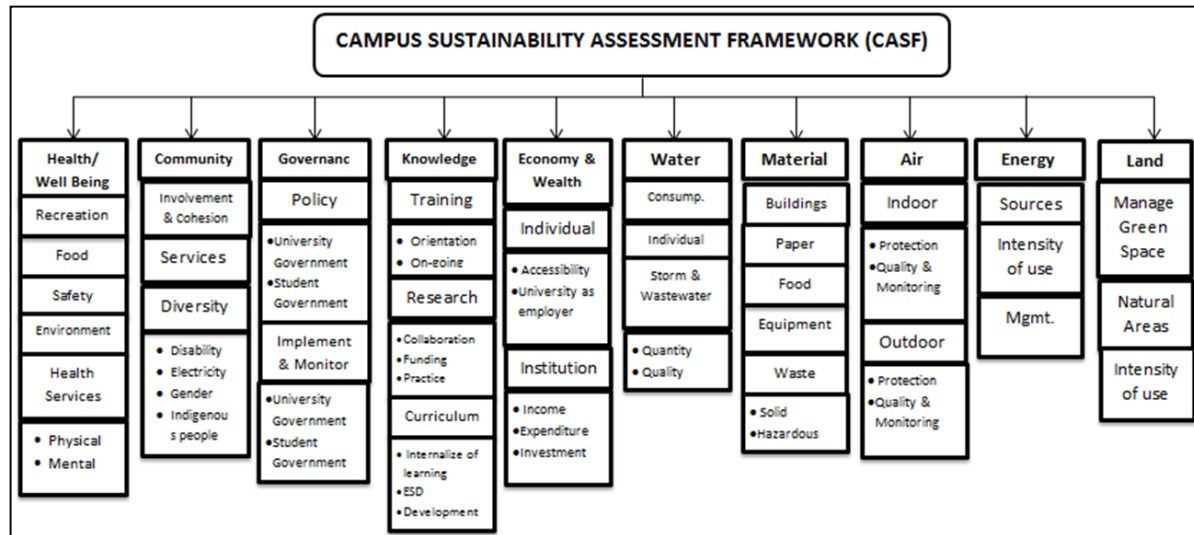


Figure 3 :- Campus Sustainability Assessment Framework (CASF) (Cole, 2003).

### UI GreenMetric Ranking

UI GreenMetric Ranking is a sustainability ranking system developed by Universitas Indonesia which was designed to compare the commitment of universities to foster and promote green and sustainable activities within the campus. This ranking tool was launched in April 2010 and emphasized the aspect of global climate change, clean energy and water conservation, waste recycling and green transportation. There are six elements in UI GreenMetric Ranking and each of the element is allocated with different percentage of indicators allocation. The six elements are: - (1) setting and infrastructure (15%), (2) energy and climate change (21%), (3) waste (18%), (4) water (10%), (5) transportation (18%) and education (18%) (UI GreenMetric, 2016).

The overall framework of UI GreenMetric ranking is shown in Figure 4.0.

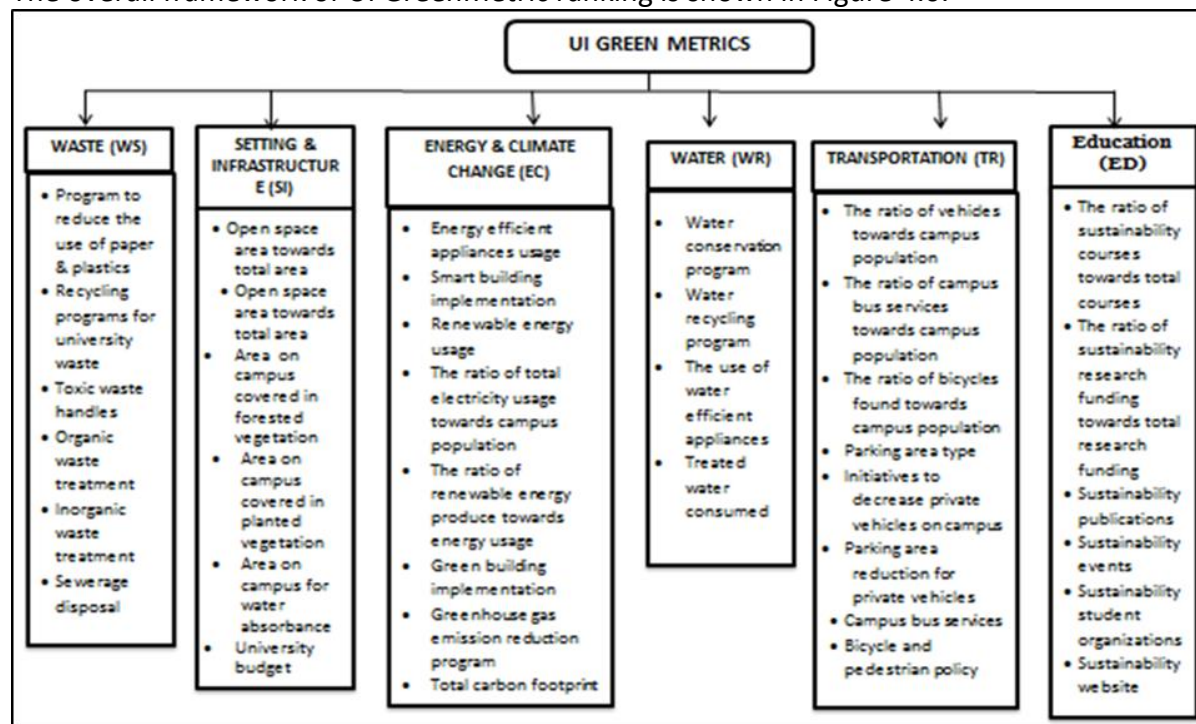


Figure 4:- UI GreenMetric 's framework (UI GreenMetric, 2016).

### Sustainable Assessment Questionnaire (SAQ)

Sustainable Assessment Questionnaire (SAQ) refers to a sustainability survey tools that cover several initiatives of HEIs. The questionnaire measures seven elements of sustainability initiatives which includes curriculum, research and scholarship, operations, faculty and staff development and rewards, outreach and service, student opportunities and lastly administration, mission and planning (ULSF, 2009). This tool contains 25 survey questions and divides into seven main areas of sustainability in HEIs. The overall framework of the SAQ indicators questions is shown in Figure 5.0.

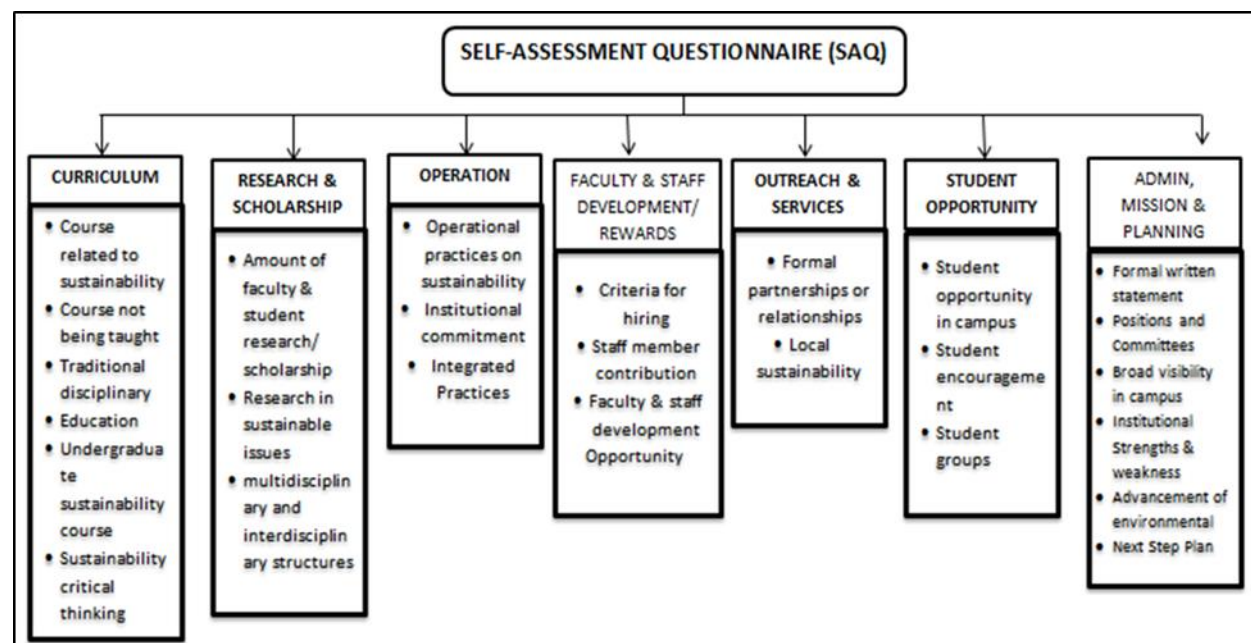


Figure 5.0:- Self- Assessment Questionnaire (SAQ) framework (ULSF, 2009)

Table 1.0 :- The summary of four SATs with the elements and number of indicators

SATs	Elements & Number of Indicators	Total Indicators
Sustainability Tracking, Assessment & Rating System (STARS)	Academic – 11 indicators Engagement – 15 indicators Planning & Administration – 14 indicators Operation – 23 Innovation – 2	65 indicators
Campus Sustainability Assessment Framework (CASf)	Health & Well-being - 19 indicators Community – 25 indicators Knowledge – 21 indicators Governance – 20 indicators Economy & Wealth- 18 indicators Water – 11 Material – 16 Air - 14 Energy – 12 Land - 13	169 indicators
UI GreenMetric Ranking	Setting & Infrastructure – 6 indicators Energy & Climate Change – 8 indicators Waste – 6 indicators Water – 4 indicators Transportation – 8 indicators Education – 6 indicators	38 indicators
Sustainable Assessment Questionnaire (SAQ)	Curriculum – 8 indicators Research & Scholarship – 3 indicators Operation – 3 indicators Faculty & Staff – 3 indicators Outreach – 2 indicators Student Opportunity – 3 indicators Administration, mission & planning – 6 indicators	28 indicators



### Analysis

Two analyses were carried out. First analysis was to analyze the percentage of total indicators of each sustainability tool according to the three main aspect of sustainability; - social, environment and economic. Second analysis was to analyze the percentage of total indicators each sustainability tool in each of the elements covered within the tools.

The process of analysis was done by gathering all indicators between the four sustainability assessment tools. Then, the indicators will be sorted into two analyses. In the first analysis, all indicators were accumulated and divided into the three aspect of sustainability; - social, environment and economic. The classification of each indicator was determined based on its definition from two scholars. The definition of environment and economic aspect is based on Ekins, (2011) while the aspect of social refers to Valdes-Vasques,( 2011). Then, the sum of each aspect were counted and presented into percentage.

In the second analysis, all indicators were accumulated and divided into the elements of sustainability. Each tool covers different type of elements and with different number of indicator. The sum of indicators of each element were counted and then presented into percentage.

### Result

The results between the two analyses are shown in Table 2.0 and 3.0.

Analysis 1 :- The analysis of indicator's percentage within the aspect of sustainability.

Table 2.0:- The analysis of percentage indicator between the aspect of sustainability.

No.	Sustainable Assessment Tools	Percentage of Sustainability's Indicators		
		Social	Environment	Economic
1	Sustainability Tracking, Assessment and Rating System (STARS)	61.9% (39)	22.2% (14)	15.9% (10)
2	Campus Sustainability Assessment Framework (CSAF)	45.1% (79)	40.6% (71)	14.3% (25)
3	Sustainability Assessment Questionnaire (SAQ)	48.6% (17)	37.1% (13)	14.3% (5)
4	UI Green Metric Ranking	47.4% (18)	47.4% (18)	5.2% (2)
Average Percentage		50.75%	36.83%	10.5%

Analysis 2 :- The analysis of indicator's percentage within the elements of sustainability.

Table 3.0:- The analysis of indicators among the key elements of sustainability.

The Percentage of Indicators Among Key Elements of Sustainability							
SAQ		CASf		STARS		UI GreenMetric	
Element	%	Element	%	Element	%	Element	%
Curriculum	20	Health & Well Being	11	Academics	17	Setting & Infrastructure	16
Research & Scholarship	12	Community	15	Engagement	23	Energy & Climate	20
Operation	12	Knowledge	12	Operations	35	Waste	16
Faculty	12	Governance	12	Planning & Administration	22	Water	11
Outreach	8	Economy/ Wealth	11	Innovation & Leadership	3	Transport	21
Student	12	Water	7			Education	16
Administration	24	Material Air	9 8				
		Energy Land	7 8				

STARS

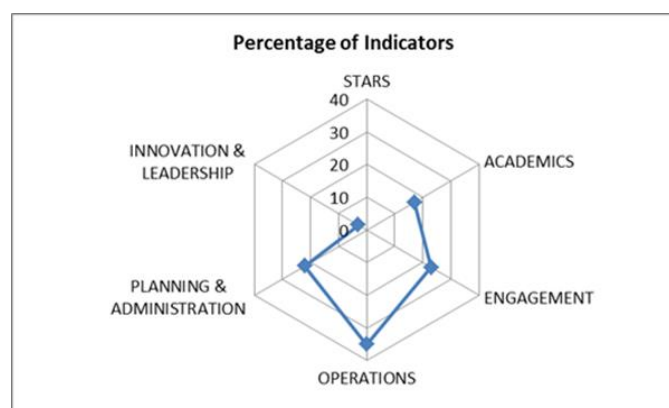


Figure 6.0 :- The indicators analysis between elements in STARS.

CASf

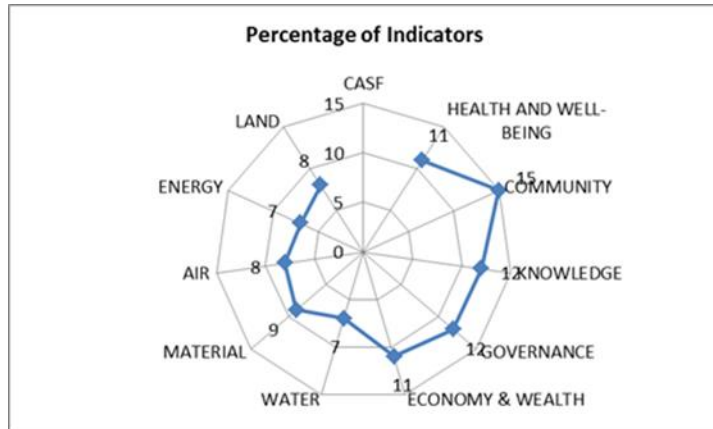


Figure 7.0 :- The indicators analysis between elements in CASF.

## UI GreenMetric

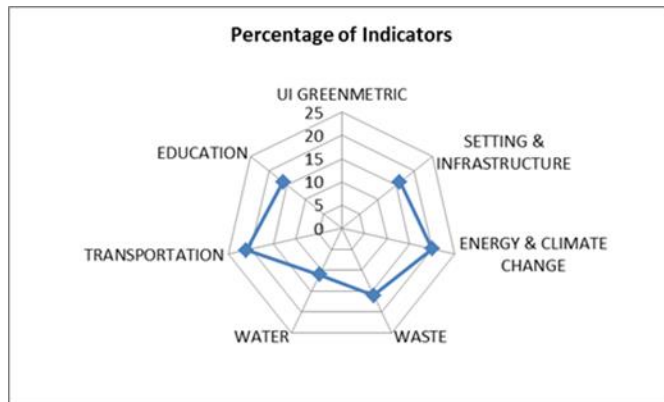


Figure 8.0 :- The indicators analysis between elements in UI GreenMetric.

## SAQ

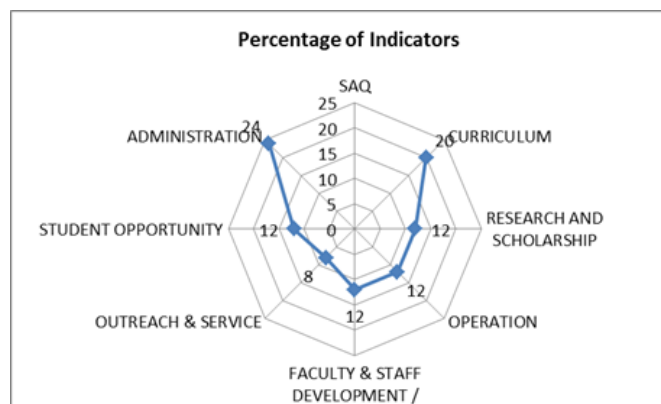


Figure 9 :- The indicators analysis between elements in SAQ.

## Discussion

The results from Analysis 1 indicate that there is a significant imbalance proportion of indicators according to three main aspects of sustainability. STARS has more indicators in social (61.9%) but less indicators in economic (15.9%). CASF is also has more indicators in social (45.1%) and environment (40.6%). However, it is still less in economic (14.3%). The findings are similar with UI GreenMetric and SAQ which contain more indicators in social and environment compare to economic. UI GreenMetric Ranking tool has less than 10% percentage indicators (5.2%) in economic while the SAQ covers only 14.3% of indicators in economic.

In analysis 2, result shows that each SAT comes out with different kind of indicator allocation in each element of the tools. In STARS, the percentage of indicators is more in the element of operations (35%) compare to engagement (23%) and planning and administration (22%). In CASF, the allocation of indicators is average between the elements contained in ecological (39%) and people (61%). In UI GreenMetric, the proportion percentage of indicators in each element is slightly equal and same with transportation (21%), energy and climate (20%), setting and infrastructure (16%), waste (16%), education (16%) and water (11%). In SAQ, the tool is more focused on the element of administration (24%) and curriculum (20%). Other elements are also quite average and equal such as research and scholarship (12%), operation (12%), faculty and staff development (12%), student opportunity (12%) and outreach and service (8%).

## Conclusion

Based on analysis 1, it can be concluded that there is significant imbalance of indicator proportion between the three aspects of sustainability. Result shows that most of the SATs allocate more of their indicators into the aspect of social and environment. However, in the aspect of economic, the allocation percentage is quite less and low.

Based on analysis 2, it can be concluded that there is a significant imbalance between the proportions of each element in the SATs. Most of SATs allocate their indicators based on the element that they consider as important and crucial. For example, in STARS, it allocates many indicators into the element of operation while SAQ emphasized more on the element of administration and curriculum.

## Recommendation

There are several recommendations that can be made based on the findings. First, the indicators among the four SATs should be improved and restructured. The allocation of indicators must be balanced within the three main aspects of sustainability and the elements within the SATs. Second, there is a need for further research on several other SATs used by many higher education institutions around the world such as College Sustainability Report Card, Good Company's Sustainable Pathways Toolkit, National Wildlife Federation's State of the Campus Environment, Campus Ecology and many more. Third, further research also can be done in reviewing and comparing the elements contained in the SATs with the elements of sustainability in the literature. There are several scholars who did the analysis of declaration and literatures. Wright (2003) and Lozano et.al (2013) outline ten initiatives of sustainability from declaration which are curriculum, research, operation, outreach and collaboration, university collaboration, assessment, trans disciplinary, institutional framework, SD through campus experience and educate the educators.

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