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# Study of UI GreenMetric Compliance in Higher Learning Institutions

Masalinda Mansor[1]*, Nuwairani Azurawati Siha[2], Nurul Akmal Kamaruddin[2]

[1]Department of Civil Engineering, Politeknik Mukah, KM 7.5 Jalan Oya, 96400, Mukah, Sarawak, Malaysia
[2]Department of Electrical Engineering, Politeknik Mukah, KM 7.5 Jalan Oya, 96400, Mukah, Sarawak, Malaysia

*Corresponding author: masalinda@pmu.edu.my
Please provide an **official organisation email** of the corresponding author

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**Abstract**

Compliance of sustainable development is crucial. Institutions need to take actions for developing sustainability improvement. Institutions of higher learning have a great responsibility to encourage sustainability culture in society. The journey towards sustainability for universities and polytechnics is in different stages based on their institutions' priorities to become a green campus. UI GreenMetric World University Rankings is a trigger for Mukah Polytechnic to become a sustainability green campus. The first objective of this study is to identify criteria indicator for UI GreenMetric World University Rankings. The second objective is to analyse UI GreenMetric World University Rankings compliance in Mukah Polytechnic. In 2022, Mukah Polytechnic has made a first step by joining UI GreenMetric World University Rankings. Mukah Polytechnic manage to be in 595$^{th}$ place out of 1050 participant in world rank. Due to this achievement, several improvements made to boost Mukah Polytechnic world rank in 2023. Each criterion being analyse, to search for any lacking. Based on the study, it is found that energy and climate change was getting low marks. Number of renewable energy sources in campus and innovative programs in energy and climate change are the main contribution for low marks in these criteria. According to the analysis, there are several criteria contributing to high marks such as water and waste management. An improvement in documentation, more sustainability innovation and green activities will be executed in 2023. This is a preliminary afford to establish Mukah Polytechnic as a leading green campus worldwide.

*Keywords: - Green campus, sustainability indicator*



## 1. Introduction

There are a lot of sustainability audits available nowadays. Among the popular green building audit is The Green Building Index (GBI), LEED (Leadership in Energy and Environmental Design), Energy Star, BREEAM (the Building Research Establishment Environmental Assessment Method), Green Globes, Living Building Challenge, National Green Building Standard, Green Guard, WELL Building Standard, and many others. The selection of green building assessment tools based on type of building and recognition need by a building management, institution, or government policy.

Mukah Polytechnic has selected The UI GreenMetric World University Ranking as the assessment tool for green building compliances. Selection made due to the building status as a higher learning institution. The world rank recognition granted by the organizer is a major influence of Mukah Polytechnic taking part in the evaluation.

### *1.1 Problem Statement*

This study conducted based on few emerge issues. According to Mushtaha et al. (2022), universities have direct and indirect negative effects on the natural and social environment due to the large areas covered and the pollutants released.

The trend of global warming has intensified, and global warming has caused significant damage to the natural ecological environment, on which humankind depends on survival (Zhou et al., 2022)

The increasingly waste apparent negative impact of human activities on the environment has heightened the urgency for the chemistry community to adopt greener and more sustainable practices (Sheldon et al., 2022)

Drinking water is beginning to be a rare resource in several regions and both uses of water and wastewater outlet are of main environmental and economic significance in several nations (Ghernaout et al., 2019)

### *1.2 Objectives*

This study consisting of two objectives, that are:

1. To identify criteria indicator for UI GreenMetric World University Rankings.
2. To analyse UI GreenMetric World University Rankings compliance in Mukah Polytechnic.

### *1.3 Research Scope*

This study conducted in Mukah Polytechnic.

## 2. Literature Review

The University of Indonesia launched the non-profit UI GreenMetric World University Rankings in 2010. The ranking made based on evidence provide by institution following six criteria and several sub criteria. It is up to the institutions to provide relevant data, to get maximum marks for the ratings. Fig. 1 shows criteria taken into consideration for the evaluation.

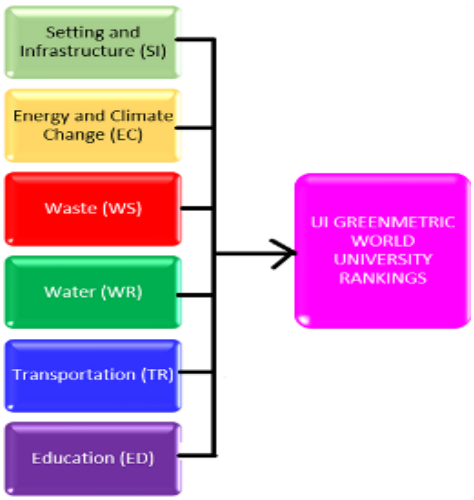


Fig. 1. Framework of this study

The value of infrastructure projects to society is challenging to measure (Zerjav et al., 2021). Setting and Infrastructure (SI) appraisal consisting of a lot of indicators to take care of. Some of this element is not provided in the institutions such as vegetation area and budget allocated for sustainability.

According to Verichev et al. (2020), global climate change is changing meteorological parameters and climate zones for building in different parts of the world, as well as changing energy consumption by dwellings. Consequently, the possibility of applying the current building standard of the country in future climatic conditions has been questioned.

There has been an increase in waste management applications within the context of sustainability activities recently. The most important reason for that was the legal requirement for recycling and disposal of the waste generated by the producers. Developing nations still utilize the storage method, while developed countries recycle almost all produced waste to produce raw materials and energy (Koçak, & İkizoğlu, 2020).

Table 2 shows the weightage percentage for score provided in UI GreenMetric World University Rankings. Based on the distribution, it is found that the highest percentage distribution goes to Energy and Climate Change (EC).

Table 2. The weightage of categories in UI GreenMetric World University Rankings

| No | Category | Percentage of Total Points (%) |
|---|---|---|
| 1 | Setting and Infrastructure (SI) | 15 |
| 2 | Energy and Climate Change (EC) | 21 |
| 3 | Waste (WS) | 18 |
| 4 | Water (WR) | 10 |
| 5 | Transportation (TR) | 18 |
| 6 | Education (ED) | 18 |
| | **TOTAL** | 100 |

## 3. Methodology

Qualitative approaches used as the methodology for this study. The observation and data collected to fulfil the evidence requirement by UI GreenMetric World University Rankings.

## 4. Analysis and Findings

The level of compliance for UI GreenMetric World University Rankings by Mukah Polytechnic is based on result gained from Fact File 2022. Mukah Polytechnic managed to place in 595 positions, out of 1050 institutions throughout the world, and in 25$^{th}$ rank in Malaysia.

### *4.1 Objective 1*

The first objective achieves by compiling criteria indicators for UI GreenMetric World University Rankings. There are six criteria has been recognized, that is Setting and Infrastructure (SI), Energy and Climate Change (EC),

Waste (WS), Water (WR), Transportation (TR) and Education (ED).

### *4.2 Objective 2*

Mukah polytechnic achievement based on UI GreenMetric World University Rankings self-audit document submission. Fig. 2 is the data analysed by UI GreenMetric organizer, establish from document submission made in 2022. Based on six criteria listed in UI GreenMetric World University Rankings, it is found that Mukah Polytechnic has an issue of energy and climate change, the percentage is low, that is 10%. Fig. 2 shows the percentage distribution among six criteria listed. The strength of Mukah Polytechnic in this self-audit document submission is water, where the compliance is 21%, compared to other criteria.

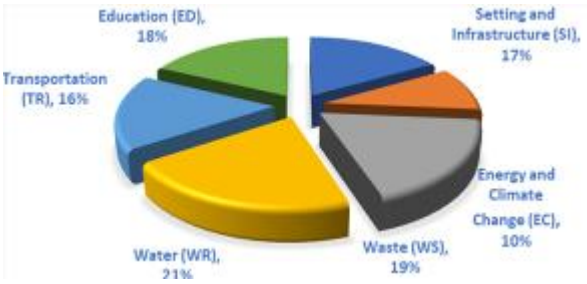


Fig. 2. Overall percentage of categories compliance of Mukah Polytechnic

Setting and Infrastructure, consisting of eleven sub criteria to be observe. Out of those sub criteria, Fig. 3, shows that SI.6 (university budget for sustainability effort) get the lowest score. This issue occurs due to a lack of awareness regarding the importance of providing budget for sustainability. SI.3 (Area on campus covered in planted vegetation), shows a low score. Even though Mukah Polytechnic located in rural area, the amount of planted vegetable is limited.

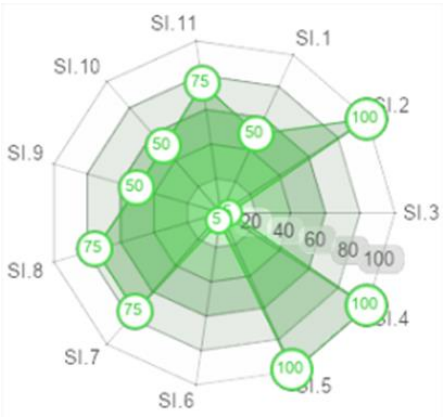


Fig 3. Setting and Infrastructure (SI) compliance of Mukah Polytechnic

Based on the evaluation for energy and climate change in Fig. 4, it shows that Mukah Polytechnic did not getting any marks in item EC 3 (Number of renewable energy sources in campus) and EC 9 (Number of innovative programs in energy and climate change). Basically, there are several innovations produced related to environmental sustainability, due to lack of evidence, the document cannot be submitted.

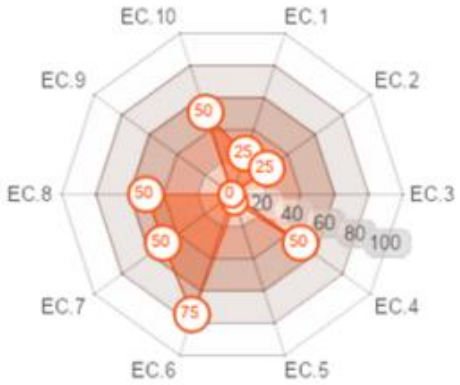


Fig 4. Energy and Climate Change (EC) compliance of Mukah Polytechnic

Energy saving program also being implement in Mukah Polytechnic, Table 3 shows the reduction of energy consumption in February and March 2023. This reduction is the impact of Earth Hour activity on 26 March 2022.

Table 3. Mukah Polytechnic electrical consumption

| SARAWAK ENERGY BILL (RM) | | | ENERGY (kWh) | $CO_2$ (Metric Ton) |
|---|---|---|---|---|
| FEBRUARY 2022 (28 DAYS) | 49,609.94 | 1 BULAN | 181305 kWh | 152.29 |
| | 1,772.00 | 1 HARI | 6475.18 kWh | 5.44 |
| | 73.83 | 1 JAM | 269.80 kWh | 0.23 |
| MARCH 2022 (31 DAYS) | 37,787.49 | 1 BULAN | 140242 kWh | 117.8 |
| | 1,218.95 | 1 HARI | 4523.94 kWh | 3.8 |
| | 50.79 | 1 JAM | 188.50 kWh | 0.16 |

Referring to Fig. 5, it is revealing that WS.6 (sewerage disposal) has the lowest score. This low marks gain due to lack of documentation prepared. To look at the bright side, Mukah Polytechnic possess a groundwater well, able to provide clean water for residents. The water kept in a water tank, and well-treated.


Fig 5. Waste (WS) compliance of Mukah Polytechnic

The water (WR) compliance of Mukah Polytechnic shows in Fig. 6. WR.2 (water recycle program) and WR (water pollution control in campus area) appear to have lower marks compare to others. Mukah Polytechnic have undergo this element, but not widely implemented.


Fig 6. Water (WR) compliance of Mukah Polytechnic

Based on Fig. 7, TR.2 (shuttle service) has been rated as zero. The reason for not providing shuttle services is because size of institutions that is not so big. Covered pedestrian walkway provided almost everywhere in Mukah Polytechnic. Indirectly it is capable to reduce CO2 emission.


Fig 7. Transportation (TR) compliance of Mukah Polytechnic

Courses related to fundamentals of renewable energy are available in Mukah Polytechnic. These courses exposed students to the importance of green sustainability. Based on Fig. 8, ED.2 (the ratio of sustainability research funding towards total research funding) is very low. To enhance an individual career, Mukah Polytechnic encourages research to be carried out as part of excellence criterion. However, funding is up to an individual. This is why appropriate documentation cannot be submitted.

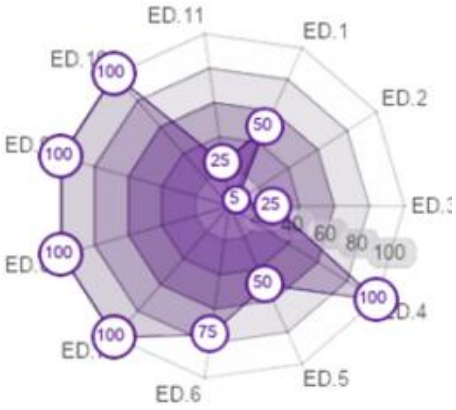


Fig 8. Education (ED) compliance of Mukah Polytechnic

## 5. Conclusion

The criteria listed in UI GreenMetric World University Rankings are comprehensive. It covers almost every element needed to maintain an institution to be in a sustainable environment.

Setting and Infrastructure (SI) is considered as a fix element. One of the methods to improve scoring in assessment is by increasing the planting of vegetables in Mukah Polytechnic area. Extra budget for sustainability should be implementing.

Energy and Climate Change (EC) compliance of Mukah Polytechnic is focusing on item that has not being implement yet. Initiative to provide a renewable energy source in campus and innovative programs in energy and climate change must be carried out.

An issue of Waste (WS) compliance of Mukah Polytechnic is not so urge. Development in sewerage disposal will assist Mukah Polytechnic to become a sustainability campus.

Water (WR) compliance of Mukah Polytechnic is in good conditions, in accordance with the needs of becoming a sustainable campus.

Lack of shuttle service in campus due to campus size and the existence of covered walkway throughout Mukah Polytechnic. Transportation (TR) compliance of Mukah Polytechnic still in adequate conditions.

Education (ED) compliance of Mukah Polytechnicis set back due the ratio of sustainability research funding towards total research funding. There are a lot of research being carried out but there not divided specifically either there related to sustainability or not.

To ensure the compliance of UI GreenMetric World University Rankings, sufficient document must be prepared. The document provided need to comply with the criteria listed. Staff and management must be educated in documenting all evidence related to green sustainability. The management support is a motivation to achieve a better rank in 2023 is by complying all criteria, especially the low rating gain in 2022.

## References

Ghernaout, D., Elboughdiri, N., & Al Arni, S. (2019). Water Reuse (WR): Dares, restrictions, and trends. *Applied Engineering*, *3*, 159-170.

Koçak, E., & İkizoğlu, B. (2020). Types of waste in the context of waste management and general overview of waste disposal in Turkey. *International Journal of Agriculture Environment and Food Sciences*, *4*(4), 520-527.

Miller, T. (2021). Infrastructure: How to define it and why the definition matters. In *Infrastructure: How to Define It and Why the Definition Matters: Miller, Tracy*. [Sl]: SSRN.

Sheldon, R. A., Bode, M. L., & Akakios, S. G. (2022). Metrics of green chemistry: Waste minimization. *Current Opinion in Green and Sustainable Chemistry*, *33*, 100569.

Verichev, K., Zamorano, M., & Carpio, M. (2020). Effects of climate change on variations in climatic zones and heating energy consumption of residential buildings in the southern Chile. *Energy and Buildings*, *215*, 109874.

Zerjav, V., McArthur, J., & Edkins, A. (2021). The multiplicity of value in the front-end of projects: The case of London transportation infrastructure. *International Journal of Project Management*, *39*(5), 507-519.

Zhou, A., Xin, L., & Li, J. (2022). Assessing the impact of the carbon market on the improvement of China's energy and carbon emission performance. *Energy*, *258*, 124789.