Enhancing Sustainability Performance at Kolej Komuniti Jasin Through Smart Green Initiatives

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Abstract
This paper critically evaluates Kolej Komuniti Jasin's sustainability performance using the UI GreenMetric framework, a global ranking system for university sustainability that assesses six key sectors: Setting and Infrastructure, Energy and Climate Change, Waste, Water, Transportation, and Education and Research. The study aims to highlight strengths and identify areas for improvement in Kolej Komuniti Jasin's sustainability practices. Data was collected through institutional records, surveys, and observations, and analyzed using both quantitative and qualitative methods. The results show that Kolej Komuniti Jasin performs well in several areas, including the provision of green spaces, the implementation of energy-efficient appliances, and the establishment of a Zero Emission Vehicle policy. However, significant gaps were identified in renewable energy adoption, carbon footprint reduction, water management, and comprehensive waste management. The specific scores were 750/1500 for infrastructure, 960/2100 for energy and climate change, 750/1800 for waste, 210/1000 for water, and 835/1800 for transportation. Qualitative analysis of the Education and Research sector suggested a need for further integration of sustainability into curricula and research activities. The study underscores the importance of comprehensive and systematic assessment frameworks like UI GreenMetric in driving sustainability in higher education institutions. By addressing the identified gaps and building on existing strengths, Kolej Komuniti Jasin can significantly enhance its sustainability performance. The study recommends several key actions to improve sustainability practices, including investing in renewable energy, enhancing resource efficiency programs, strengthening waste management systems, expanding sustainable transportation options, integrating sustainability into education and research, and leveraging innovative technologies. These actions are essential for aligning Kolej Komuniti Jasin with global sustainability standards and significantly enhancing its overall sustainability performance. In conclusion, the UI GreenMetric framework provides actionable insights for guiding strategic investments and policy decisions at Kolej Komuniti Jasin, ultimately contributing to global sustainability goals and serving as a benchmark for other community colleges in Malaysia and beyond.

Keywords: Energy Efficiency; UI GreenMetric; Renewable Energy; Sustainability; Waste Management.

1.0 Introduction

Climate change is a pressing global issue requiring concerted efforts from all sectors to mitigate its effects. Malaysia has committed to reducing its greenhouse gas (GHG) emissions by 10-40% by 2020 and aims to further reduce 40-95% by 2050 (Samsuri et al., 2019). University campuses, functioning similarly to small towns, significantly influence both their internal community and the surrounding environment through their facilities and activities (Gültekin, 2019). Promoting awareness of Sustainable Development Goals (SDGs) within campus activities can substantially enhance environmental sustainability. According to Haliza (2018), sustainability involves actions taken in economic, social, and environmental domains that do not compromise the ability of future generations to meet their needs.

In 2010, Universitas Indonesia introduced the UI GreenMetric World University Rankings, a system that assesses university sustainability through 39 indicators across six criteria: Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), and Education (ED). These indicators collectively address key sustainability issues and are widely adopted by universities globally to evaluate and improve their sustainability performance, including their carbon footprint (Nyoman et al., 2019).

Kolej Komuniti Jasin has prioritized climate change mitigation through various sustainability initiatives since 2020, focusing on energy management, waste management, water management, and renewable energy (Imas et al., 2019). Regular monitoring and assessment of these initiatives, including their carbon footprint, are conducted in alignment with SDG criteria. This study aims to evaluate the sustainability of the Kolej Komuniti Jasin campus using the UI GreenMetric World University Rankings.

2.0 Literature Review

The UI GreenMetric has established itself as a comprehensive framework for evaluating and enhancing sustainability performance across diverse sectors. This tool assesses the sustainability of organizations, institutions, and communities by integrating environmental, social, and economic dimensions.

One seminal work introducing the UI GreenMetric concept is by Imas Gandasari, Oot Hotimah, and Mieke Miyarsah (2020). The authors advocate for a holistic approach to sustainability assessment, emphasizing the necessity of addressing not only environmental factors but also social and economic aspects.

Further research by Maria Andrades and colleagues, notably in the paper by Nyoman Suwartha and Mohammed Ali Berawi (2019), explored the metric's application in higher education. Their findings underscored the relevance and effectiveness of UI GreenMetric criteria in evaluating sustainability performance in universities and colleges, highlighting the critical need to integrate sustainability principles into both educational practices and campus operations.

Additionally, the study by Bakaruddin et al. (2020), examined the practical implications of adopting the UI GreenMetric. Through qualitative case study analysis, the authors identified key challenges and opportunities in implementing the framework, including data collection, stakeholder engagement, and organizational change management.

In summary, the literature emphasizes the UI GreenMetric's significance as a robust framework for assessing sustainability performance. While current research has provided valuable insights into its conceptualization and application, further studies are necessary to explore its effectiveness in various contexts and its potential to drive substantive sustainability improvements (Effine et al., 2019).

3.0 Methodology

This study aims to evaluate the sustainability level of the Kolej Komuniti Jasin campus using qualitative research methods. The research began with a comprehensive analysis of Kolej Komuniti Jasin's sustainability initiatives and commitments, aligned with the parameters set by the UI GreenMetric World. The six UI GreenMetric criteria and their respective weightings are: Environment and Infrastructure (15%), Energy and Climate Change (21%), Waste (18%), Water (10%), Transportation (18%), and Education (18%).

All indicators from the UI GreenMetric World University Ranking 2021 Guidelines were assessed for Kolej Komuniti Jasin within this study's framework. The research involved conducting interviews with Kolej Komuniti Jasin officials and experts, reviewing campus plans, quality targets, and strategic documents, and evaluating the availability of green campus features. The themes for the study were developed from these interviews and observations, which were then integrated with UI GreenMetric World University Ranking parameters. Table 1 illustrates the weight of each assessment category in the UI GreenMetric World University Ranking.

Table 1: UI GreenMetric World University Ranking weight for each category

No	Categories	Weighting (%)
1	Setting and Infrastructure	15
2	Energy and Climate Change	21
3	Waste	18
4	Water	10
5	Transportation	18
6	Research and Education	18
	Total	**100**

Following the analysis, we'll prioritize the recommendations based on their potential impact and feasibility. Then, we'll create a comprehensive action plan outlining steps to implement these mitigation measures effectively. This plan will include timelines, responsible parties, and resources needed to address the identified issues and improve the university's standing in the UI GreenMetric World University Ranking.

4.0 Result and Discussion

4.1 Setting and Infrastructure

Table 2: Setting and infrastructure sector indicators.

Setting and Infrastructure			
Indicator		**Point**	**Score**
SI.1	The ratio of open space area towards total area	200	100
SI.2	Area on campus covered in forest	100	50
SI.3	Area on campus covered in planted vegetation	200	50
SI.4	Area on campus for water absorbance	100	100
SI.5	The ratio of open space area divided campus population	200	50
SI.6	University budget for sustainability effort	200	100
SI.7	Percentage of operation and maintenance activities of building during Covid-19 Pandemic	100	100
SI.8	Campus facilities for disabled, special needs and or maternity care	100	75
SI.9	Security and safety facilities	100	75
SI.10	Health infrastructure facilities for students, academics and administrative staff's Wellbeing	100	25
SI.11	Conservation: plant, animal and wildlife, genetic resources for food and agriculture secured in either medium or long-term conservation Facilities	100	25
Total		**1500**	**750**

The assessment of the Setting and Infrastructure sector within the UI GreenMetric framework involves several key indicators with assigned point values. Kolej Komuniti Jasin scored 750 out of a possible 1500 points overall. For the ratio of open space area to total area, the campus received 100 out of 200 points. The area covered by forest and planted vegetation on campus

scored 50 out of 100 and 200 points, respectively. The area designated for water absorbance earned a full 100 points. The ratio of open space per capita scored 50 out of 200 points. The university's budget for sustainability efforts and the percentage of operational and maintenance activities during the COVID-19 pandemic each earned a full 100 points. Campus facilities for the disabled and special needs, as well as security and safety facilities, each scored 75 out of 100 points. Health infrastructure for the well-being of students, academics, and administrative staff, and conservation efforts for plants, animals, and genetic resources each scored 25 out of 100 points. Overall, these scores reflect Kolej Komuniti Jasin's efforts and areas needing improvement in campus sustainability infrastructure.

4.2 Energy and Climate Change

Table 3: Energy and Climate Change sector indicators

Energy and Climate Change			
Indicator		**Point**	**Score**
EC.1	Energy efficient appliances usage	200	150
EC.2	Smart building program implementation	300	225
EC.3	Number of renewable energy source in campus	300	0
EC.4	The total electricity usage divided by total campus population	300	225
EC.5	The ratio of renewable energy production towards total energy usage per year	200	50
EC.6	Element of green building implementation	200	50
EC.7	Greenhouse gas emission reduction program	200	100
EC.8	The ratio of total carbon footprint divided campus population	200	10
EC.9	Number of innovative program(s) during covid-19 pandemic	200	75
SI.10	Impactful university program(s) on climate change	100	75
Total		**2100**	**960**

The evaluation of the Energy and Climate Change sector under the UI GreenMetric framework involves several key indicators, with Kolej Komuniti Jasin scoring 960 out of a possible 2100 points. The campus achieved 150 out of 200 points for the use of energy-efficient appliances and 225 out of 300 points for the implementation of a smart building program. However, it scored zero points for the number of renewable energy sources on campus. The total electricity usage per capita scored 225 out of 300 points. The ratio of

renewable energy production to total energy usage and the inclusion of green building elements both scored 50 out of 200 points each. The campus's greenhouse gas emission reduction program received 100 out of 200 points. The ratio of total carbon footprint per capita scored 10 out of 200 points. During the COVID-19 pandemic, innovative programs and impactful university programs on climate change scored 75 out of 200 and 100 points respectively. These scores indicate Kolej Komuniti Jasin's strengths and areas for improvement in managing energy and addressing climate change

4.3 Waste

The assessment of the Waste sector within the UI GreenMetric framework for Kolej Komuniti Jasin involves several key indicators, with the campus achieving a total score of 750 out of a possible 1800 points. The recycling program for university waste scored 150 out of 300 points, while the program to reduce the use of paper and plastic on campus earned 75 out of 300 points. Organic waste treatment also received 75 out of 300 points. Inorganic waste treatment, toxic waste treatment, and sewerage disposal each scored 150 out of 300 points. These scores highlight Kolej Komuniti Jasin's efforts in waste management and identify areas where further improvements can be made to enhance sustainability practices.

Table 4: Waste sector indicators

Waste			
Indicator		**Point**	**Score**
WS.1	Recycling program for university waste	300	150
WS.2	Program to reduce the use of paper and plastic in campus	300	75
WS.3	Organic waste treatment	300	75
WS.4	Inorganic waste treatment	300	150
WS.5	Toxic waste treatment	300	150
WS.6	Sewerage disposal	300	150
Total		**1800**	**750**

4.4 Water

In assessing the Water sector of Kolej Komuniti Jasin within the UI GreenMetric framework, the campus achieved a total score of 210 out of a possible 1000 points. Notably, both the water conservation program and its implementation, as well as the water recycling program, attained scores of 100 out of 200 points each. However, the utilization of water-efficient appliances and the consumption of treated water garnered no points. Furthermore, the provision of additional handwashing and sanitation facilities during the COVID-19 pandemic scored only 10 out of 200 points. These

findings suggest that although efforts have been made in water conservation and recycling, there remain substantial areas for improvement, particularly concerning the adoption of efficient appliances and treated water usage.

Table 5: Water sector indicators

Water Indicator		**Point**	**Score**
WR.1	Water conservation program & implementation	200	100
WR.2	Water recycling program implementation	200	100
WR.3	Water efficient appliances usage	200	0
WR.4	Consumption of treated water	200	0
WR.5	Percentage of additional handwashing and sanitation facilities during Covid-19 pandemic	200	10
Total		**1000**	**210**

4.5 Transportation

Table 6: Transportation sector indicators

Transportation Indicator		**Point**	**Score**
TR.1	The ratio of total vehicles (cars and motorcycles) divided by total campus population	200	150
TR.2	Shuttle services	300	0
TR.3	Zero Emission Vehicles (ZEV) policy on campus	200	200
TR.4	The ratio of Zero Emission Vehicles (ZEV) divided by total campus population	200	10
TR.5	Ratio of parking area to total campus area	200	150
TR.6	Transportation program designed to limit or decrease the parking area on campus for the last 3 years	200	50
TR.7	Number of transportation initiatives to decrease private vehicles on campus	200	50
TR.8	Pedestrian policy on campus	300	225
Total		**1800**	**835**

In the evaluation of the Transportation sector for Kolej Komuniti Jasin within the UI GreenMetric framework, the campus obtained a total score of 835 out of 1800 points. Notably, the ratio of total vehicles to campus population scored 150 out of 200 points, whereas shuttle services received no points. The campus's Zero Emission Vehicles (ZEV) policy earned a perfect score of 200 points, but the ratio of ZEVs to the total campus population only achieved 10 out of 200 points. Furthermore, the ratio of parking area to total campus area scored 150 out of 200 points. Transportation programs aimed at limiting or decreasing parking over the past three years, as well as initiatives to reduce private vehicle usage, each scored 50 out of 200 points. On a positive note, the campus's pedestrian policy received 225 out of 300 points. These scores underscore Kolej Komuniti Jasin's strengths in implementing a ZEV policy and pedestrian-friendly measures, while also indicating areas for improvement, particularly in shuttle services and initiatives to reduce vehicle usage on campus.

4.6 Education and Research

Table 7: Education and Research sector indicators

Education and Research			
Indicator		**Point**	**Score**
ED.1	The ratio of sustainability courses towards total courses/modules	300	300
ED.2	The ratio of sustainability research funding towards total research funding	200	10
ED.3	Sustainability publications	200	50
ED.4	Number of events related to sustainability	200	100
ED.5	Number of student organizations related to sustainability	200	50
ED.6	University-run sustainability website	200	100
ED.7	Sustainability report	100	50
ED.8	Number of cultural activities on campus	100	50
ED.9	Number of university program(s) to cope with Covid-19 pandemic	100	100
ED.10	Number of sustainability community services project organized and/or involving students	100	100
ED.11	Number of sustainability-related startups	100	25
Total		**1800**	**935**

When assessing the commitment of educational and research institutions to sustainability in academia, various metrics are considered. These metrics encompass integrating sustainability courses into curricula, allocating funds for sustainability research, publishing work on sustainability topics, participating in relevant events, and supporting sustainability initiatives such as student organizations and dedicated websites. Additionally, the evaluation emphasizes the significance of addressing contemporary challenges like the Covid-19 pandemic and promoting sustainability through cultural activities, community projects, and entrepreneurial ventures. Overall, these indicators offer a comprehensive framework for gauging academic institutions' dedication to advancing sustainability efforts.

5.0 Conclusions and Suggestion

The assessment of Kolej Komuniti Jasin using the UI GreenMetric framework reveals both strengths and areas for improvement in the institution's sustainability efforts. The college has shown commendable performance in areas such as providing green spaces, implementing energy-efficient appliances, and establishing a Zero Emission Vehicle (ZEV) policy. However, significant gaps remain, particularly in renewable energy adoption, carbon footprint reduction, efficient water usage, and comprehensive waste management. The lack of renewable energy sources and low scores in water and waste management indicate a need for more aggressive strategies and innovative programs. Enhancing sustainability initiatives, increasing funding, and integrating sustainability more deeply into the curriculum and campus operations are crucial steps forward. Overall, while Kolej Komuniti Jasin has made notable strides, a more holistic and committed approach is essential to meet and exceed global sustainability standards.

To improve Kolej Komuniti Jasin's sustainability performance, several strategic initiatives can be implemented. Investing in renewable energy sources like solar panels and wind turbines, along with expanding energy-efficient appliances and smart building technologies, will significantly reduce the carbon footprint. Enhancing water management through efficient fixtures and comprehensive conservation programs is essential, as is strengthening waste management practices by expanding recycling, reducing paper and plastic usage, and improving organic and toxic waste treatment. Introducing shuttle services, increasing the ratio of Zero Emission Vehicles, and developing pedestrian and cycling-friendly infrastructure will improve transportation sustainability. Integrating sustainability into the curriculum, increasing research funding, and supporting student organizations focused on environmental issues will boost education and research efforts. Engaging the campus community through awareness campaigns and actively participating in sustainability programs is crucial. Establishing a dedicated sustainability office to monitor progress and secure additional funding will ensure continuous improvement. Leveraging innovative technologies, such as IoT for resource monitoring and block chain for waste tracking, will further enhance sustainability efforts, positioning Kolej Komuniti Jasin to meet and exceed global standards.

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