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Comprehensive Analysis of Mahasarakham University's Sustainability Efforts and Global Ranking Achievements in 2024

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Abstract

Universities play a pivotal role in advancing global sustainability through education, impactful research, and environmentally responsible operations. This study evaluates the sustainability initiatives of Mahasarakham University (MSU) in alignment with the UI Green Metric World University Rankings criteria, with a particular focus on its performance in 2024. Since joining the rankings in 2011 with an initial total score of 4,781 points, MSU has steadily improved, achieving a total score of 8,475 points in 2024. The analysis examines three primary dimensions: the integration of sustainability into academic curricula, where sustainable courses increased to 55 programs out of 95 total offerings; the enhancement of sustainability-focused research, reflected in a 77% increase in related publications over the past three years; and the implementation of community engagement projects, which rose significantly from 44 projects in 2021 to 71 in 2023. The findings demonstrate MSU's consistent progress, with notable achievements in aligning its strategic plans with sustainability goals. However, challenges remain in optimizing resource allocation and expanding international collaborations. By synthesizing lessons learned and analyzing trends, this study identifies best practices and offers strategic recommendations for MSU and other institutions aspiring to excel in global sustainability benchmarks. The results underscore universities' essential role as catalysts for sustainable development, providing actionable insights into enhancing operational efficiency and academic contributions.

Keywords: *UI Green Metric World University Rankings, Mahasarakham University, Environmental Management, Sustainability.*

Introduction

The UI GreenMetric World University Rankings were initiated by Universitas Indonesia (UI) in 2010 to assess and promote sustainability efforts in higher education institutions worldwide. Serving as a tool for measuring universities' sustainability policies and programs, the UI GreenMetric has since grown into a global benchmark for sustainable campus practices. The ranking framework is grounded in the principles of environment, economy, and equity, offering universal criteria and indicators that are adaptable across diverse institutions and regions (Leal Filho et al., 2019; Berchin et al., 2021; Galleli, et al., 2022; Leal Filho et al., 2023; Domingos et al., 2024). Initially, the 2010 rankings included 95 universities from 35 countries. By 2024, participation had expanded to 1,477 institutions across 95 countries, reflecting the increasing recognition and commitment to sustainability in higher education (UI GreenMetric, 2024). The rankings have not only become a tool for assessing performance but also a platform for sharing best practices among institutions worldwide (Suwartha et al., 2019; Bagire et al., 2024; Kherazi et al., 2024).

The six core categories of the UI GreenMetric—Setting and Infrastructure, Energy and Climate Change, Waste Management, Water Usage, Transportation, and Education and Research—serve as the foundation for evaluation. These categories are weighted to reflect the significance of various sustainability dimensions, with Education and Research being particularly crucial (Muñoz-Suárez et al., 2020; Atici et al., 2021;

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Boiocchi et al., 2023; Smolennikov et al., 2024). The emphasis on Education and Research aligns with the role of universities in driving societal progress through knowledge creation and dissemination. Furthermore, these categories underscore the integration of sustainable practices in campus operations, curriculum design, and institutional research agendas (Fallah Shayan et al., 2022; Mokski et al., 2023; Rasli et al., 2024). This structured framework has encouraged universities to adopt a more holistic approach to sustainability.

Thai universities have been active participants in the UI GreenMetric rankings since its early years, reflecting the country's growing emphasis on integrating sustainability into higher education. Institutions such as Kasetsart University, Mahidol University, and Chiang Mai University have consistently performed well, leveraging their strong research capacities and sustainable campus initiatives. By 2024, over 59 Thai universities had joined the rankings, demonstrating a commitment to advancing sustainability in education and operations. These universities focus on areas such as renewable energy, waste management, and biodiversity conservation, aligning their strategies with Thailand's national sustainability goals (Tangwanichagapong et al., 2017; Tabucanon et al., 2021). Furthermore, initiatives like the Green University Network of Thailand have facilitated collaboration among institutions, enabling them to share best practices and collectively improve their performance in global rankings (GUNT, 2022). This collaborative approach has not only elevated the international standing of Thai universities but also highlighted their role in contributing to sustainable development in the region (Charmondusit and Saingam, 2024).

Mahasarakham University (MSU), a leading state university in Thailand, has participated in the UI GreenMetric rankings since 2011. The university's commitment to sustainability is evident in its mission to provide education, conduct impactful research, and offer community services while preserving cultural heritage (Mahasarakham University, 2023; UI GreenMetric, 2024; Phrophayak et al., 2024; Sribanasarn et al., 2024). MSU aligns its strategic plans with the United Nations' Sustainable Development Goals (SDGs) and has consistently improved its ranking through dedicated efforts in sustainability-oriented education, research, and operations. In 2024, MSU achieved a total score of 8,475, demonstrating significant progress from its initial participation in 2011.

The focus on education and research is central to MSU's sustainability strategy. With 55 sustainable academic programs among its 95 offerings and a strong emphasis on sustainability-related research, the university exemplifies its role as a driver of innovation and community engagement. MSU's efforts extend to infrastructure development, resource management, and fostering collaborations that enhance its capacity for sustainable development.

This study evaluates MSU's progress in achieving sustainability goals within the framework of the UI GreenMetric rankings. By analyzing data and trends from 2011 to 2024, the research highlights key achievements, challenges, and strategies that have shaped the university's trajectory. The findings contribute to a broader understanding of how universities can align their operations, curriculum, and research with global sustainability benchmarks, serving as a model for other institutions.

Material and Methods

Study Area

Mahasarakham University (MSU) has undergone significant development since its inception, establishing the Khamriang Campus in Kantarawichai District to accommodate its growing needs and expanding operations. Located approximately seven kilometers from the original campus, Khamriang Campus now serves as the administrative and academic hub of the university. With 17 faculties, 2 colleges, and 1 institute actively operating, MSU has gained recognition as one of Thailand's fastest-growing universities. The university's enrollment has seen a remarkable increase, rising from fewer than 10,000 students in its earlier years to over 40,000 students at present. This growth is supported by the ongoing construction and expansion of faculty buildings and other infrastructure on the Khamriang Campus. The total area of the main campus spans an impressive 1,697,600 square meters, making it well-equipped to support the university's diverse academic, research, and extracurricular activities. As shown in Figure 1, the Khamriang

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Campus layout integrates sustainability principles, with open spaces, green areas, and facilities that reflect MSU's commitment to eco-friendly practices and sustainable development, aligning with its role in the UI GreenMetric rankings. This strategic expansion underscores MSU's dedication to enhancing its capacity to deliver quality education and foster innovation (Mahasarakham University, 2023).

Figure 1. Mahasarakham University

Methodology

This study employs a structured framework to analyze the categories, criteria, and indicators employed in the UI GreenMetric World University Rankings. The methodology encompasses an exploration of the criteria and weighting used in the rankings, as well as the specific data submission processes that universities must follow.

The Criteria

In 2024, the categories and weighting of points were revised to accommodate new questions, ensuring a comprehensive evaluation of sustainability across participating universities. As shown in Table 1 and Figure 2, the rankings are based on six main categories: Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), and Education and Research (ED). These categories are assigned percentages of the total score, reflecting their importance in sustainability assessment (UI GreenMetric, 2024; Phrophayak et al., 2024).

Table 1. Categories Used in the Rankings and Their Weighting

No.	Categories	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 and Research (ED)	18
	TOTAL	100

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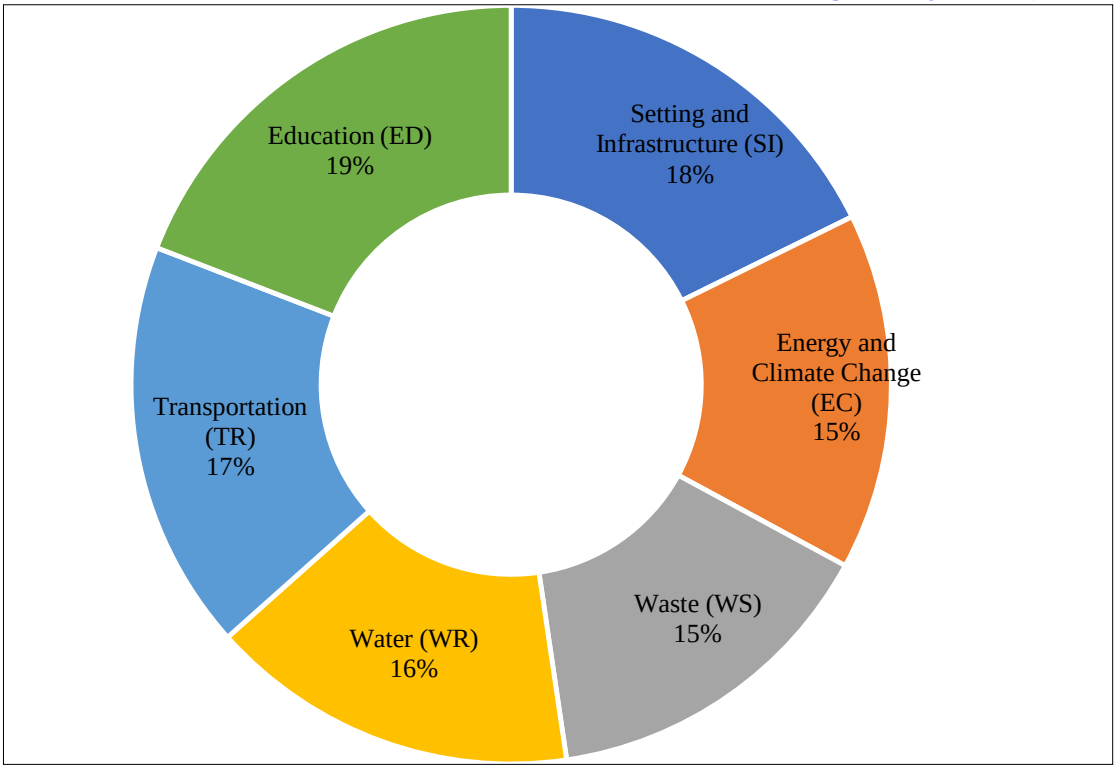

Figure 2. Categories Used in the Rankings and Their Weighting

The detailed criteria and indicators for each category, presented in Tables 2–7, provide insights into the specific evaluation dimensions. For Setting and Infrastructure (SI), indicators such as open space ratio, conservation efforts, and health and safety facilities emphasize eco-friendly campus development, contributing up to 1,500 points (Table 2). The Energy and Climate Change (EC) category, with a total of 2,100 points (Table 3), prioritizes renewable energy adoption, energy efficiency, and carbon footprint reduction, highlighting universities' roles in combating climate change. Waste Management (WS), valued at 1,800 points (Table 4), assesses initiatives like recycling programs and the treatment of various waste types, reinforcing sustainable waste practices. The Water (WR) category (1,000 points, Table 5) focuses on conservation, recycling, and pollution control, ensuring sustainable water use. In Transportation (TR), with a total weight of 1,800 points (Table 6), the criteria evaluate measures to promote low-emission vehicles, enhance pedestrian accessibility, and reduce reliance on private transportation. Finally, Education and Research (ED) (1,800 points, Table 7) underscores the university's academic contributions to sustainability, including the proportion of sustainability courses, related research funding, and student-driven sustainability initiatives. Together, these criteria provide a holistic framework for evaluating and fostering sustainable development within higher education institutions.

Table 2. Criteria and Indicators for Setting and Infrastructure (SI)

No.	Criteria of Setting and Infrastructure (SI)	Point
SI1	The ratio of open space area towards total area	200
SI2	Area on campus covered in forest	100
SI3	Area on campus covered in planted vegetation	200
SI4	Area on campus for water absorption besides the forest and planted vegetation	100
SI5	The ratio of open space area divided campus population	200
SI6	University budget for sustainability effort	200
SI7	Percentage of operation and maintenance activities of building in one year period	100

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No.	Criteria of Setting and Infrastructure (SI)	Point
SI8	Campus facilities for disabled, special needs and or maternity care	100
SI9	Security and safety facilities	100
SI10	Health infrastructure facilities for students, academics and administrative staff's wellbeing	100
SI11	Conservation: plant, animal and wildlife, genetic resources for food and agriculture secured in either medium or long-term conservation facilities	100
Total	15%	1,500

Table 3. Criteria and Indicators for Energy and Climate Change (EC)

No.	Criteria of Energy and Climate Change (EC)	Point
EC1	Energy efficient appliances usage	200
EC2	Smart building implementation	300
EC3	Number of renewable energy sources on campus	300
EC4	Total electricity usage divided by total campus' population (kWh per person)	300
EC5	The ratio of renewable energy production divided by total energy usage per year	200
EC6	Elements of green building implementation as reflected in all construction and renovation policies	200
EC7	Greenhouse gas emission reduction program	200
EC8	Total carbon footprint divided by total campus' population (metric tons per person)	200
EC9	Number of innovative program(s) in energy and climate change	100
EC10	Impactful university program(s) on climate change	100
Total	21%	2,100

Table 4. Criteria and Indicators for Waste (WS)

No.	Waste (WS)	Point
WS1	3R (Reduce, Reuse, Recycling) program for university's waste	300
WS2	Program to reduce the use of paper and plastic on campus	300
WS3	Organic waste treatment	300
WS4	Inorganic waste treatment	300
WS5	Toxic waste treatment	300
WS6	Sewage disposal	300
Total	18%	1,800

Table 5. Criteria and Indicators for Water (WR)

No.	Water (WR)	Point
WR1	Water conservation program & implementation	200
WR2	Water recycling program implementation	200
WR3	Water efficient appliances usage	200
WR4	Consumption of treated water	200
WR5	Water pollution control in the campus area	200
Total	10%	1,000

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Table 6. Criteria and Indicators for Transportation (TR)

No.	Transportation (TR)	Point
TR1	The total number of vehicles (cars and motorcycles) divided by total campus' population	200
TR2	Shuttle services	300
TR3	Zero Emission Vehicles (ZEV) policy on campus	200
TR4	The total number of Zero Emission Vehicles (ZEV) divided by total campus population	200
TR5	Ratio of ground parking area to total campus' area	200
TR6	Program to limit or decrease the parking area on campus for the last 3 years (from 2022 to 2024)	200
TR7	Number of initiatives to decrease private vehicles on campus	200
TR8	Pedestrian path on campus	300
Total	18%	1,800

Table 7. Criteria and Indicators for Education and Research (ED)

No.	Education and Research (ED)	Point
ED1	The ratio of sustainability courses to total courses/subjects	300
ED2	The ratio of sustainability research funding to total research funding	200
ED3	Number of scholarly publications on sustainability	200
ED4	Number of events related to sustainability	200
ED5	Number of activities organized by student organizations related to sustainability per year	200
ED6	University-run sustainability website	200
ED7	Sustainability report	100
ED8	Number of cultural activities on campus	100
ED9	Number of university sustainability program(s) with international collaborations	100
ED10	Number of sustainability community services project organized and/or involving students	100
ED11	Number of sustainability-related startups	100
Total	18%	1,800

The scoring for each indicator is numeric, allowing for statistical analysis. Raw scores are weighted according to the criteria and aggregated to determine the final ranking score. Universities achieving higher scores demonstrate excellence in implementing sustainability practices across these dimensions.

Data Submission

Data submission for the 2024 rankings is conducted through an online platform, with universities required to submit their data between May and October 2024. The validation process occurs between October and November 2024, ensuring the accuracy and reliability of submitted data. The final results are announced in December 2024, reflecting the cumulative efforts of participating universities (UI GreenMetric, 2024).

Results and Discussion

UI Green Metric World University Rankings Results

The UI Green Metric World University Rankings have expanded significantly since their establishment in 2010, marking milestones in sustainability benchmarking for higher education. Table 8 provides a comprehensive summary of the number of participating universities, countries, and Thai institutions,

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alongside annual highlights. Participation increased from 95 universities in 35 countries in 2010 to a record 1,477 universities in 95 countries in 2024. Key developments include the introduction of SDG-aligned indicators in 2015, revisions to scoring metrics in 2018, and a growing emphasis on global collaborations and long-term sustainability in 2024. Thailand's participation has also grown, with the number of universities increasing from 2 in 2010 to 59 in 2024, highlighting the country's strong commitment to sustainability in education.

Table 8. Number Of Participating Universities, Countries, and Thai Universities, Along with The Key Highlights for Each Year

Year	Number of Participating Universities	Number of Participating Countries	Number of Universities from Thailand	Key Highlights
2010	95	35	2	Launch of the inaugural rankings by Universitas Indonesia; pioneering effort in sustainability metrics.
2011	178	42	5	Significant growth in participation; introduction of standardized reporting for sustainability efforts.
2012	215	49	6	Expansion to Latin America and the Middle East; focus on energy, water, and transportation metrics.
2013	301	54	13	Enhanced evaluation methodology; greater diversity in institutional participation worldwide.
2014	360	62	15	Strong focus on waste management and climate change adaptation; increased involvement from Asia.
2015	407	65	19	Introduction of six main categories; integration of SDG-aligned indicators for the first time.
2016	516	74	22	Substantial increase in African university participation; emphasis on renewable energy practices.
2017	619	76	27	Introduction of mobility-focused criteria; rise in participation from South America.
2018	719	81	24	Significant revisions to scoring metrics; major participation from Southeast Asia and Europe.
2019	780	84	37	Record number of participants; introduction of water conservation metrics and digital integration.
2020	912	86	37	Adaptations for data collection during COVID-19; focus on health and resilience initiatives.
2021	956	87	39	Increased alignment with UN SDGs; higher representation from universities in Central Asia.
2022	1050	89	47	Focused on "Sustainability Innovation" and the integration of local cultural practices into rankings.

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2023	1182	91	55	Theme: "Innovation, Impacts, and Future Directions of Sustainable Universities"; growth in Arab region.
2024	1477	95	59	Highest participation to date; emphasis on long-term sustainability policies and global collaborations.

Mahasarakham University (MSU) has actively participated in these rankings since 2011. As shown in Figure 3, the university's global ranking has improved significantly, moving from 140th in 2011 to its best position of 100th in 2024. This consistent improvement underscores MSU's dedication to sustainability practices, which are strategically aligned with the six assessment categories: Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), and Education and Research (ED) (UI Green Metric, 2024).

Figure 4 presents MSU's national ranking history, showing a strong performance among Thai universities. Initially ranked 11th nationally in 2011, MSU climbed to 6th in 2024. This progress reflects the university's ability to adapt and innovate within its sustainability framework, particularly in response to increasing national and global competition in the UI Green Metric rankings.

Figure 5 illustrates MSU's total score growth, which rose from 4,356 in 2011 to 8,475 in 2024. The score increase demonstrates systematic enhancements across all assessment categories. The most notable improvements are in Energy and Climate Change (EC) and Education and Research (ED), which have shown substantial contributions to the university's total score. These improvements highlight the university's focus on renewable energy projects, carbon footprint reduction, and the integration of sustainability principles in academic programs (UI Green Metric, 2023; Sribanasarn et al., 2024).

Figure 6 provides a category-wise breakdown of scores over time. The steady rise in the EC and ED categories is particularly noteworthy. This growth aligns with MSU's initiatives to promote energy efficiency through the adoption of renewable energy technologies and to expand sustainability-related research and education. The university's efforts have included increasing the proportion of sustainability courses and research funding, organizing events and activities focused on sustainability, and fostering international collaborations (Domingos et al., 2024; Phrophayak et al., 2024).

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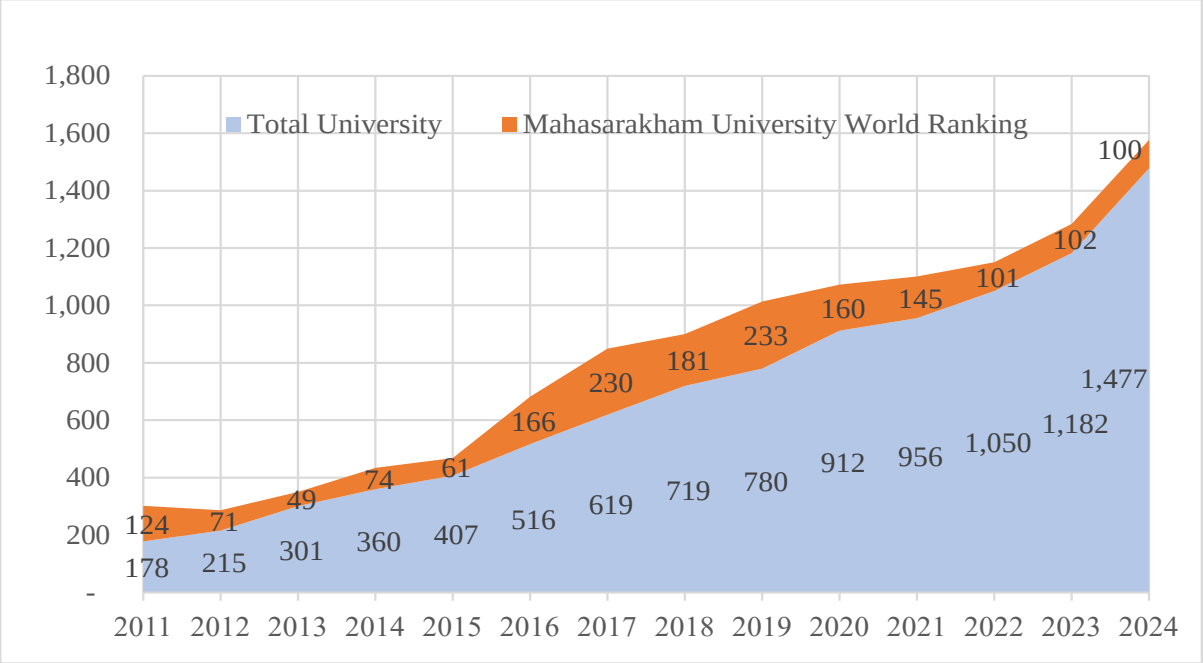

Figure 3. World Ranking History 2011-2024 For Mahasarakham University

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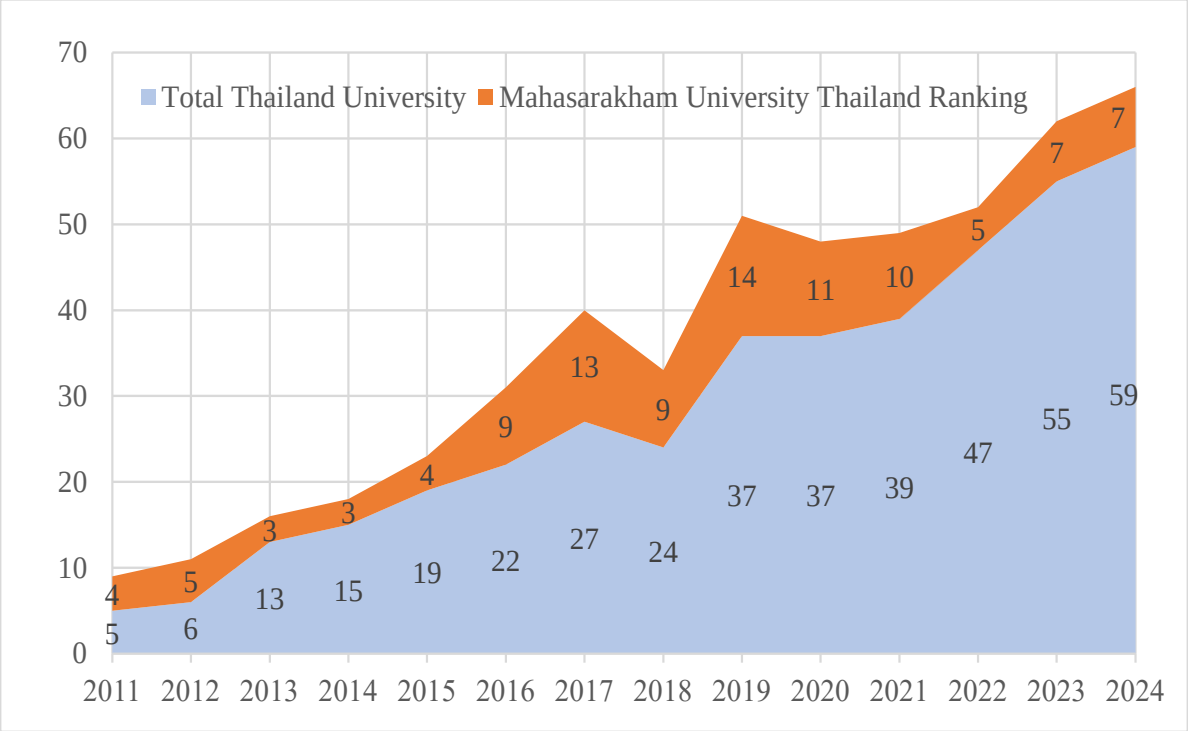

Figure 4. Country ranking history 2011-2024 for Mahasarakham University

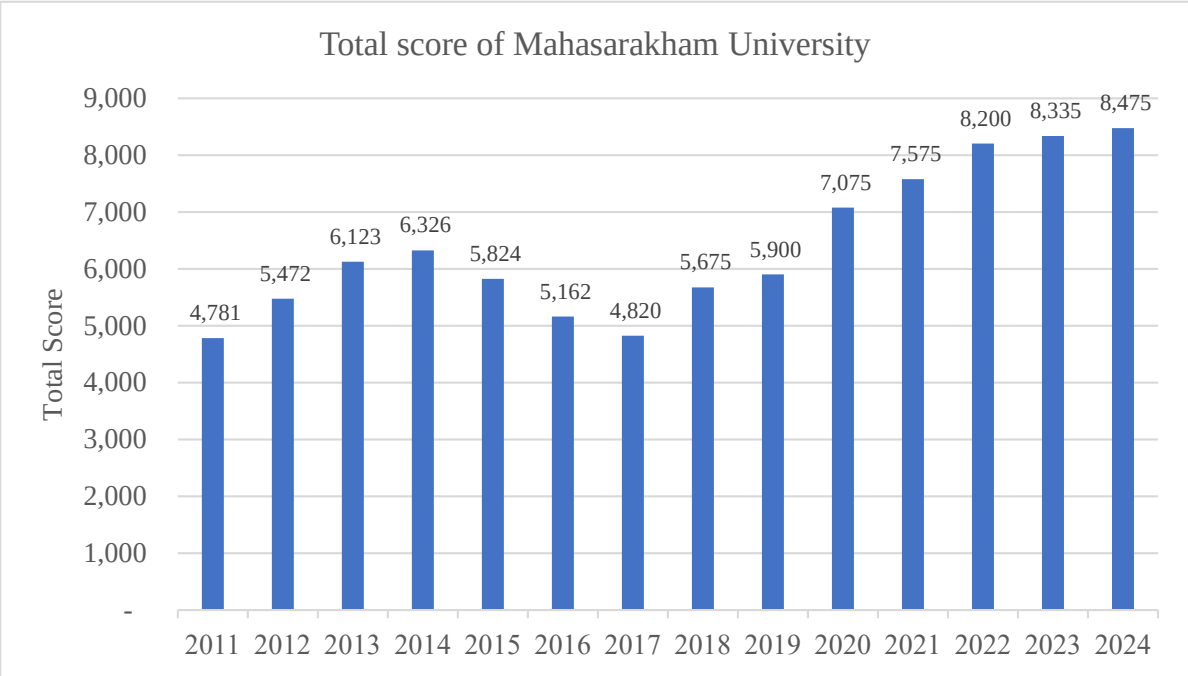

Figure 5. Total Score History Diagram

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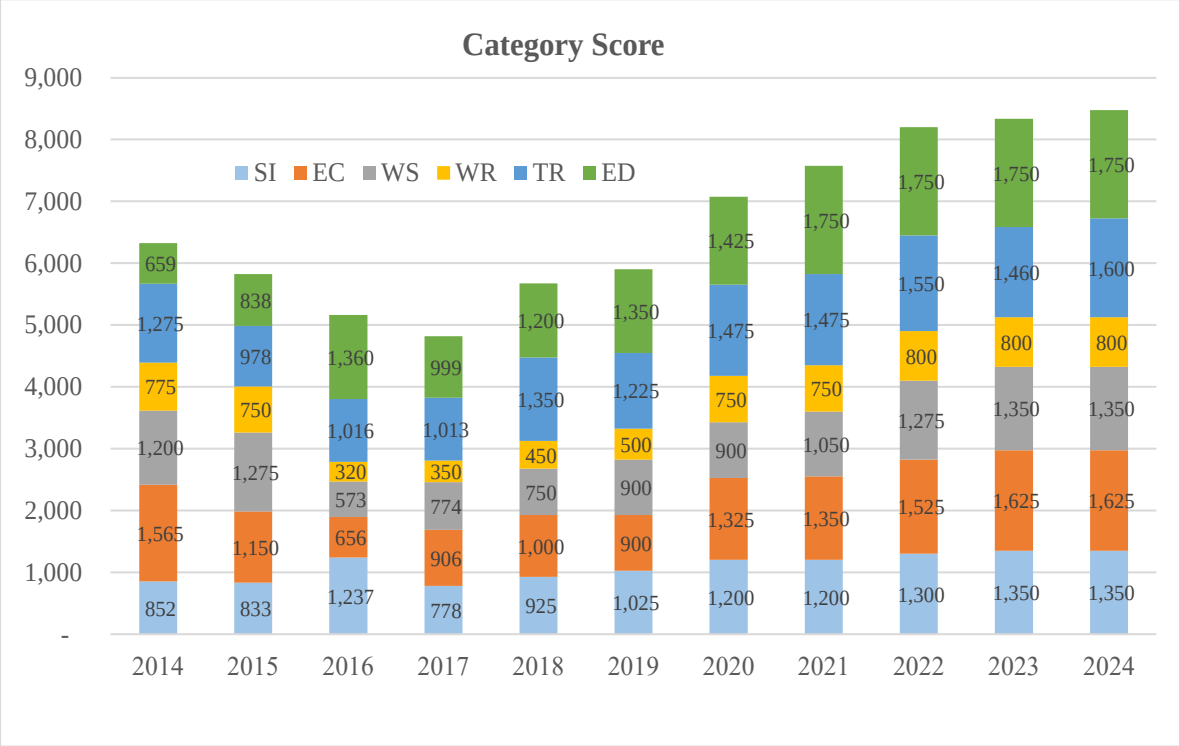

Figure 6. Score Diagram for Each Category

The consistent growth in MSU's global and national rankings reflects its commitment to achieving sustainable development in alignment with UI Green Metric criteria. The steady rise in total scores, as shown in Figure 5, is a testament to the university's strategic focus on all six categories, with particular strength in EC and ED. This progress aligns with broader trends in higher education, where institutions are increasingly integrating sustainability into their operations and academic frameworks (Phrophayak et al., 2024; Sribanasarn et al., 2024).

Thailand's increasing participation in the UI Green Metric rankings, as shown in Table 8, highlights the country's dedication to fostering sustainability in its higher education sector. The rise from 2 participating universities in 2010 to 59 in 2024 demonstrates a nationwide prioritization of sustainability, driven by supportive policies and initiatives that encourage institutions to align with global sustainability goals (Charmondusit and Saingam, 2024).

In conclusion, Mahasarakham University's upward trajectory in both global and national rankings underscores its role as a leader in sustainability within Thailand. By focusing on renewable energy, sustainability education, and impactful research, MSU has set an example for other institutions. These efforts, coupled with Thailand's collective push toward sustainability, indicate a promising future for green university initiatives in the region.

Ui Greenmetric World University Rankings Results 2024

Mahasarakham University achieved significant recognition in the UI Green Metric World University Rankings 2024 by fulfilling the evaluation criteria across six categories: Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), and Education and Research (ED). The university earned a total score of 8,475 out of 10,000, achieving 83.35% of the maximum possible points. The detailed scores for each category are presented in Table 9, while Table 10 summarizes the university's world and national rankings by category.

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Table 9. Total Score 2024

Category	Points	Maximum Points	% Maximum
Setting and Infrastructure (SI)	1,350	1,500	90.00
Energy and Climate Change (EC)	1,625	2,100	77.38
Waste (WS)	1,350	1,800	75.00
Water (WR)	800	1,000	80.00
Transportation (TR)	1,600	1,800	88.88
Education (ED)	1,750	1,800	97.22
Total Score	8,475	10,000	83.35

Table 10. Results Summary World Ranking 2024

Category	World Ranking	Country ranking
Setting and Infrastructure (SI)	55	3
Energy and Climate Change (EC)	198	10
Waste (WS)	323	24
Water (WR)	256	22
Transportation (TR)	100	9
Education (ED)	73	6

Table 9 highlights Mahasarakham University's strength in Education and Research (ED), achieving 97.22% of the maximum score, which reflects the university's consistent investment in sustainability-oriented courses, research publications, and collaborative projects. The Setting and Infrastructure (SI) category also performed strongly, reaching 90.00% of its maximum points, demonstrating effective campus planning and resource management. The Water (WR) and Transportation (TR) categories scored 80.00% and 88.88%, respectively, underscoring the university's initiatives in water conservation, efficient water usage, and sustainable mobility strategies (UI Green Metric, 2024).

Energy and Climate Change (EC) and Waste (WS) categories, while scoring slightly lower at 77.38% and 75.00%, respectively, still reflect substantial progress. These results are indicative of ongoing efforts to implement renewable energy solutions, reduce greenhouse gas emissions, and improve waste management systems on campus (Phrophayak et al., 2024).

Table 10 presents the university's global and national rankings by category. Mahasarakham University achieved its best global ranking in the Setting and Infrastructure (SI) category at 55th, and its highest national ranking in the same category, placing 3rd among Thai universities. These achievements highlight the university's focus on creating sustainable and accessible campus environments. Similarly, the Transportation (TR) category, with a global ranking of 100th and a national ranking of 9th, reflects significant advancements in reducing carbon emissions and promoting eco-friendly commuting options (Charmondusit and Saingam, 2024).

Despite strong performances, there are opportunities for improvement. Categories such as Waste (WS) and Water (WR), with relatively lower rankings (323rd and 256th globally), indicate areas where Mahasarakham University can enhance waste treatment programs and water pollution control efforts to improve sustainability metrics further (Tabucanon et al., 2021; Sribanasarn et al., 2024).

Overall, Mahasarakham University's total score of 8,475 demonstrates its significant progress toward achieving sustainability goals. The university's targeted strategies and initiatives have placed it among the top-performing institutions globally, contributing to Thailand's growing prominence in green university rankings.

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Conclusion

In 2024, Mahasarakham University demonstrated commendable performance in the UI Green Metric World University Rankings, achieving a total score of 8,475 out of a maximum 10,000 points across six evaluation categories. This notable accomplishment underscores the university's ongoing commitment to sustainability in education, research, and operations.

The university excelled in Education and Research (ED), securing 1,750 points (97.22% of the maximum), highlighting its robust efforts in integrating sustainability into academic curricula, research funding, and community service projects. Similarly, Setting and Infrastructure (SI) received 1,350 points (90.00%), reflecting the university's effective management of campus facilities and green spaces. The Transportation (TR) category also showed strong performance, earning 1,600 points (88.88%), indicating successful initiatives in promoting eco-friendly mobility and reducing campus emissions.

Moderate achievements were noted in Water (WR) with 800 points (80.00%) and Energy and Climate Change (EC) with 1,625 points (77.38%), demonstrating steady progress in water conservation, renewable energy adoption, and climate change mitigation programs. However, the Waste (WS) category, with 1,350 points (75.00%), highlights an area where further improvements in waste reduction, recycling, and treatment could bolster the university's sustainability metrics.

Globally, Mahasarakham University was ranked 100th among 1,477 participating universities and achieved the 7th position nationally among 59 Thai universities. These rankings affirm the university's proactive approach to aligning its strategies with international sustainability standards and benchmarks. By consistently enhancing its operations in alignment with the UI Green Metric criteria, Mahasarakham University not only contributes to global academic discourse on sustainability but also sets a benchmark for higher education institutions striving for environmental excellence.

Looking ahead, further focus on underperforming areas, such as waste and water management, coupled with sustained efforts in education, infrastructure, and transportation, can propel Mahasarakham University to higher rankings in future evaluations.

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