



Sustainable University Strategy and Assessing Its Performance in Green Rankings

Saule Rakhmetullina, Ulan Nessipkaliyev, Olga Petrova*, Darya Surova

D. Serikbayev East Kazakhstan technical university, Kazakhstan

* Corresponding author: opetrova@edu.ektu.kz

Article Info

Received:

25 June 2025

Accepted:

8 December 2025

Published:

30 December 2025

DOI:

10.14710/jsp.2025.29873

Abstract. The article explores the development of a sustainable university strategy and the assessment of its effectiveness using the international UI GreenMetric ranking system. Using the case of D. Serikbayev East Kazakhstan Technical University, the study demonstrates how the questionnaire-based criteria of the ranking can be integrated into the university's strategic planning, educational processes, and administrative practices. The research employs a mixed-method approach, combining literature review, systems analysis, quantification of sustainability indicators, and data visualization. The findings show that transitioning from isolated environmental initiatives to a comprehensive, system-based strategy enables the university to achieve tangible sustainability outcomes and maintain its position in international rankings, even under limited resource conditions. The article also addresses the need to adapt ranking criteria to the national context and identifies directions for future research on the effective integration of the Sustainable Development Goals (SDGs) into the university setting.

Keywords:

sustainable university, green ratings, SDGs, greening education

1. Introduction

In the context of the global environmental crisis and the transition to sustainable development, universities play a crucial role in advancing the United Nations Sustainable Development Goals (SDGs). As centers of education, science, and innovation, they not only shape the environmental awareness of future generations but also serve as testbeds for the implementation of green technologies and sustainable practices. The concept of a "green university" has firmly entered the development agenda of higher education institutions across Europe, Asia, and the Americas. It encompasses strategic planning of campus sustainability initiatives aimed at reducing environmental impact, promoting the SDGs, and enhancing environmental education.

Successful implementation of sustainability in universities requires both institutional commitment and systemic changes in educational and administrative processes [1,2]. This can be achieved through a range of sustainability approaches, including energy conservation, sustainable mobility, and integration of sustainability into campus infrastructure [3]. Such initiatives are increasingly being consolidated into integrated strategies aligned with SDG implementation in campus planning [4]. Numerous universities today showcase examples of comprehensive sustainability strategies, including the development of zero-waste campuses [5,6] and ecological gardens [7].

Of particular interest is the experience of China, where the concept of a green university is supported at the national policy level, and institutions actively participate in international sustainability rankings. Research has identified key strategies, performance indicators, and challenges in embedding sustainability into higher education. Chinese universities emphasize energy efficiency (e.g., adoption of renewable energy, smart campuses), waste management (e.g., recycling, separate waste collection, zero-waste initiatives), and environmental education (e.g., integrating SDGs into curricula) [6–11].

In recent years, higher education institutions have increasingly recognized their pivotal role in advancing global sustainability agendas. Universities not only educate future professionals and decision-makers but also serve as laboratories for innovation in sustainable practices. The United Nations Sustainable Development Goals (SDGs) provide a comprehensive framework through which universities can align their teaching, research, campus operations, and community engagement with broader societal priorities. The integration of green practices, such as energy efficiency, sustainable procurement, and waste reduction, into university governance is often facilitated by explicitly linking these initiatives to the SDGs. This alignment ensures that institutional strategies move beyond isolated projects and contribute to measurable global targets. As a result, universities are progressively embedding the SDGs into curricula, strategic plans, and reporting mechanisms, thereby consolidating their role as drivers of sustainability transitions.

The study [12] maps the undergraduate curricula of the School of Social Sciences at the University of Évora to the 17 SDGs. The analysis reveals that most courses contribute, directly or indirectly, to multiple goals, although the distribution is uneven across the SDGs. Using content analysis of curricula, the authors propose recommendations for explicitly labeling SDG alignment in course descriptions. The paper emphasizes the importance of coordination between departments and the sustainability office to enhance impact. The findings demonstrate that universities can significantly increase their contribution to the SDGs through systematic integration into curricula and evaluation criteria.

The paper [13] proposes a model to assess the integration of SDGs in university syllabi, structured around four categories reflecting early stages of implementation. The model is tested on master's programs in art history across several Spanish universities, analyzing both competencies and course content. The study demonstrates how content analysis can quantitatively measure the visibility of SDGs within academic programs. Findings indicate that while many courses contain relevant content, the SDG contributions often remain implicit. The authors provide practical recommendations for program designers and accreditation bodies, including checklists and templates.

The article [14] provides an overview of the evolution of higher education programs in sustainable development, highlighting innovation, impact, and future directions as key themes for 2023. University policies, global ranking metrics (e.g., UI GreenMetric), and campus transformation initiatives are examined. The study identifies persistent barriers such as fragmented governance, limited resources, and the absence of clear performance indicators for SDG implementation. The authors argue for embedding the SDGs into long-term strategic planning, accompanied by effective monitoring and reporting frameworks. The work serves as a comprehensive review for university administrators and policymakers.

The paper [15] investigates how universities report on their contributions to the SDGs, focusing on public disclosures and international ranking platforms such as THE Impact Rankings. The analysis of reporting practices for 2019–2020 reveals substantial variability in information disclosure and verification methods. Some institutions selectively present favorable indicators, complicating cross-institutional comparison and assessment of genuine contributions. The authors argue for standardized reporting mechanisms and transparent metrics to ensure accountability. The study highlights the necessity of stricter requirements in institutional sustainability reporting.

The paper [16] conceptualizes the SDGs as a unifying framework for aligning corporate sustainability practices with academic strategies. Within the context of higher education, the author discusses how university operations—teaching, research, campus management, and procurement—can be structured around the SDG agenda. The proposed approach integrates CSR and SDG methodologies to strengthen measurable impact. Practical applications and monitoring mechanisms are presented as examples of implementation. The conclusion emphasizes the role of SDGs as a universal language and logical structure for advancing green strategies in universities.

The authors [17] present a whole-institution approach to leveraging the SDGs as a framework for university transformation in teaching, research, and campus governance. The case of Riga Technical University illustrates the adoption of a formal sustainability policy in 2025. The paper analyzes institutional drivers and barriers, ranging from strategic planning to cultural resistance. Emphasis is placed on linking policy-level commitments with concrete initiatives such as energy efficiency, green procurement, and interdisciplinary courses. The study concludes with recommendations for monitoring frameworks and stakeholder engagement strategies.

The systematic review [18] synthesizes publications from 2015–2020 on the implementation of SDGs in higher education institutions worldwide. The findings identify three main research streams: integration into curricula, institutional governance and strategy, and university–community engagement. The review highlights a lack of empirical evidence regarding the long-term impact of university initiatives. Methodological limitations are noted, alongside suggestions for future research, including longitudinal monitoring and cross-cultural comparisons. The study also provides a catalogue of tools and methods already applied in different national contexts.

The case study [19] documents the implementation of SDGs at the American University of Beirut, covering strategy, curriculum, and campus operations. Specific initiatives include curriculum revision, the establishment of interdisciplinary centers, energy efficiency improvements, and community partnerships. The paper critically examines both successes

and constraints, such as institutional barriers and resource limitations. A particular contribution is the presentation of metrics and indicators used by the university to monitor progress. The case illustrates how a large institution can combine academic and operational measures to achieve synergistic outcomes.

Special attention is given to the application of international ranking systems such as the UI GreenMetric, which serve as tools for evaluating progress toward university sustainability. The UI GreenMetric has become one of the most widely used and recognized global sustainability ranking systems. Several studies have examined the structure and significance of the UI GreenMetric questionnaire, highlighting both its strengths and methodological limitations [20].

Research shows that participation in UI GreenMetric fosters systemic transformation in universities. The questionnaire can be used to assess a university's sustainability across six key dimensions: energy, water, waste, transportation, infrastructure, and education [21,22]. Studies have also demonstrated the positive impact of consistent participation in the rankings on institutional sustainability indicators and improved standings in other systems such as THE Impact Rankings [23]. In-depth analyses of specific UI GreenMetric categories (e.g., water use, waste management) further confirm that the questionnaire is not only an external evaluation tool but also a framework for internal self-assessment and continuous improvement of sustainable practices [24,25].

Thus, sustainability strategies in universities are increasingly guided by transparent metrics and participation in international rankings, with UI GreenMetric functioning as both a platform and a methodological tool that enables data comparability and structure. However, global rankings often fail to account for regional specificities and disparities in university funding. Key challenges include limited financial resources for smaller institutions and low student engagement, which necessitates the development of motivational programs.

Despite significant progress in promoting green universities in recent years, success in rankings depends not only on environmental initiatives but also on a systemic approach that integrates SDGs into governance, education, and research. For objective evaluation, ranking criteria must be adapted to national contexts. It is also essential to critically analyze sustainability strategies, especially in the context of universities that achieve strong environmental performance despite limited financial resources.

Despite the growing number of studies devoted to the sustainable development of higher education institutions, the question of which strategies are most effective for integrating the principles of the SDGs into the university environment and how to objectively assess their success within the framework of existing rating systems remains insufficiently studied. In particular, the question of how the existing assessment criteria reflect the real progress of universities in achieving the SDGs needs to be studied.

The objective of this paper is to examine the transition from indicator-based evaluations to the development of a comprehensive university sustainability strategy, and to assess its effectiveness through the international UI GreenMetric ranking system by analyzing the alignment between institutional performance indicators and ranking outcomes, as well as the reciprocal influence of strategic planning and assessment metrics. The case of D. Serikbayev East Kazakhstan Technical University is used to illustrate this process and assess the university's success in international sustainability rankings.

2. Theoretical Approach and Methodology

The theoretical approaches underlying the formation of a sustainable university strategy define both the general goals of sustainability and specific practices in university management, education and infrastructure (Table 1).

Table 1. Approaches to the Implementation of Sustainable Practices at the University

S.No.	The theoretical approach	Short description
1	Institutional	Universities adapt to external pressure (government, ratings, sponsors) to maintain their legitimacy. Universities strive to meet expectations and norms.
2	Systemic	The University as an integrated system: sustainability is achieved through the coordination of all subsystems (education, resources, management). Sustainability is assessed as the interaction of multiple factors of the campus environment.
3	Comprehensive Triple Bottom Line	Balanced development of three areas of sustainability: ecology, society and economy. Green university strategies that combine energy efficiency, sustainable mobility, and inclusive education.
4	Mission-based	Universities form a sustainable development strategy as an integral part of their mission and values. Sustainability is becoming a core educational model and research
5	Behavioral / Engaging	The focus is on the participation of students, faculty, and staff in the development and implementation of sustainable initiatives. The involvement of all stakeholders increases efficiency and sustainable decision-making.
6	Assessment	Strategy formation through regular evaluation (UI GreenMetric, etc.), which allows you to measure progress and formalize goals.

This study employs a mixed-methods approach that combines literature analysis with an in-depth examination of the practical experience of East Kazakhstan Technical University (EKTU). Both qualitative and quantitative indicators are utilized, including the collection, analysis, and interpretation of data obtained during the implementation of the university's sustainability strategy, as well as their correlation with assessments from the international UI GreenMetric ranking. The research applies system analysis, comparative methods, and case study methodology to ensure a comprehensive evaluation.

To illustrate the implementation of sustainable development initiatives at EKTU, data visualization techniques were employed. Key sustainability indicators, such as energy conservation, reduction in water consumption, and the volume of recycled waste, were tracked over time. These metrics were compared across timeframes (before and after the adoption of sustainable practices), allowing for the visualization of progress through tables

and graphs. This enabled a clearer understanding of the university's trajectory toward achieving its green strategy objectives.

The formal integration of sustainability practices at EKTU began in 2018 and was guided by the structure and criteria of the UI GreenMetric questionnaire. Over the past seven years, the university has conducted annual assessments of the effectiveness of its green strategy, with continuous adjustments and improvements informed by the results of international green rankings [26].

Table 2. Research Data

S.No.	Type of data	Data source	Data collection period
1	Photo and video materials about the campus	Archive of the university's media center, specially created content to confirm the questionnaire indicators	no later than 3 years before submitting the data to the rankings
2	Statistical quantitative data (resource consumption, waste generation, number of events and publications, financial statements, etc.)	Accounting, academic and scientific departments, research centers, E-monitoring system	for the last 3 years before submitting to the rankings
3	Estimated data (quantitative data that cannot be used immediately after their collection according to claim 2, for example, the carbon footprint)	UI Green Metric questionnaire methods, certified and generally accepted calculation methods	for the last 3 years before the reporting year
4	Links to online resources	The university's official sites (website, Facebook and Instagram pages), pages of government agencies and news sites	for the last 3 years before submitting to the rankings
5	Ranking results	Official reports of GreenMetric UI (fact file full)	annually starting from 2020

Data collection was carried out at the university to prepare answers to the UI Green Metric questionnaire. These data were diverse, they are systematized and shown in Table 2. To achieve the objective of the study—analyzing the transition from assessing university performance through individual indicators to developing a comprehensive sustainability strategy and evaluating its effectiveness using the international UI GreenMetric system—a multi-stage methodology was applied, including the collection, systematization, and analysis of the data presented in Table 2.

Photo and video materials were used to provide documentary evidence for the UI GreenMetric questionnaire indicators (e.g., the presence of green areas, bicycle infrastructure, energy-efficient buildings). Their analysis made it possible to compare the actual state of the campus with the ranking requirements and to track the dynamics of infrastructure development. Statistical quantitative data included indicators such as energy consumption, water consumption, waste management, and the number of events and publications on sustainability, forming the basis for a quantitative analysis aimed at comparing the dynamics of resource consumption and environmental impacts, evaluating the effectiveness of sustainability-related activities, and identifying correlations between managerial decisions and performance indicators in the ranking. Estimated data, such as the calculation of the university's carbon footprint, were obtained using the UI GreenMetric methodology and internationally recognized calculation methods. Such indicators made it possible to move beyond raw statistical data and assess the integral effects of sustainability (e.g., total greenhouse gas emissions), which is a key step in the transition from isolated indicators to a systemic strategy. Links to online resources were used to verify the information (public reports, news, social media posts) and to demonstrate transparency in the university's activities. This corresponds to international requirements for data openness and increases confidence in the evaluation results. Finally, UI GreenMetric results since 2020 were used as a reference base for analyzing the university's ranking dynamics, including changes in the university's ranking positions, identification of indicators that had the greatest influence on the final results, and examination of how internal strategies and initiatives correlated with external evaluations.

All the listed sources were integrated into a single analytical framework. First, a content analysis of photo and video materials was conducted, followed by a quantitative analysis of statistical data and estimated calculations. At the final stage, a comparative analysis was performed using the official UI GreenMetric results. This approach made it possible to identify the alignment between the university's actual performance indicators and external ranking outcomes, strengths and weaknesses of the sustainability strategy, and growth points for further optimization.

Thus, the data from Table 2 were used not only as input information for the UI GreenMetric questionnaire but also as research material for testing the hypothesis about the relationship between university performance indicators, its sustainability strategy, and the outcomes in international rankings.

3. Results and Discussions

3.1. Formation of a Green Strategy

D. Serikbayev EKTU is a regional university. It has about 6,000 students and employs about 1,000 teachers and staff. At the first stage of the formation of a sustainable strategy, the EKTU followed an institutional approach in its activities (Table 1). First, it was the desire to become a member of the international community by engaging in ratings and raising awareness about the work of the university. The UI Green Metric was chosen as the most understandable and popular green rating. Therefore, in this vein, the work was based on familiarization with the requirements of the questionnaire and the formation of the first green plan based on the points of the questionnaire (Figure 1). To streamline the work at the first stage, EKTU began implementing a large-scale Green Campus project [27].

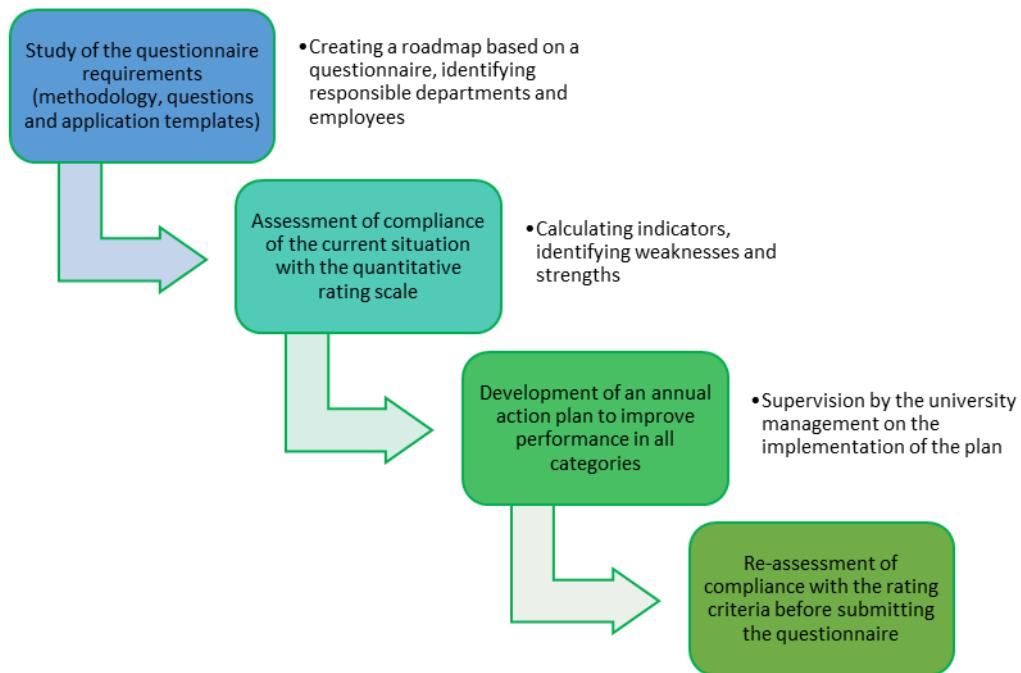


Figure 1. Implementation of the institutional approach in EKTU for 2018-2020

During the implementation of the action plan, for the first time, the university carried out such works as, for example, an assessment of the areas occupied by different types of environment and ecosystems (Figure 2) (example of data from table 2). In the future, this will allow us to form a clearer plan and indicators for the development of the university's infrastructure.

3.2. Integration of Ranking Criteria into University Strategy and the Evolution of Approaches

After achieving its first positive results in the UI GreenMetric ranking in 2020, EKTU transitioned from a fragmented to a systemic and comprehensive approach to implementing sustainable practices (see points 2 and 3 in Table 1). The Sustainable Development Goals (SDGs) were formally incorporated into the university's Strategy, and key performance indicators requiring improvement were included in the Strategic Development Plan.

Subsequent results revealed that the university could go beyond compliance with ranking assessments. This realization led to the next step: embedding green principles into the university's mission and values and expanding sustainability engagement beyond the campus community to include its broader environment (see points 4 and 5 in Table 1). Today, "Environmental culture"—understood as recognizing the value of all elements of the living world and evaluating one's actions through the lens of their impact on planetary well-being—has become an integral part of EKTU's operations [28].

The evaluative approach remains essential for refining key indicators, based on regular sustainability assessments using international rankings, particularly UI GreenMetric. These metrics help formalize objectives, monitor progress, and ensure transparency in the university's green initiatives.



Figure 2. Initial assessment of the areas of the main campus EKTU. 1 – Campus ground floor area of buildings, 2 – Parking area, 3 – Area on campus for water absorption, 4 – Area on campus in planted vegetation

3.3. Green Achievements Over a Five-Year Period and Their Alignment with the Ranking

The integration of sustainable practices into EKTU's strategic framework has enabled the university to reassess its operational processes and achieve measurable improvements in energy and resource efficiency. Figures 3 and 4 illustrate the reduction in electricity and water consumption because of implementing strategic sustainability measures.

Figure 5 presents an analysis of EKTU's position in the global UI GreenMetric ranking. As shown in the diagram, EKTU has maintained its ranking over the past three years, despite a significant increase in the number of universities participating. At present, the implementation of sustainable practices at the university is guided by the conceptual framework illustrated in Figure 6.

The comparative analysis of the university's performance in the UI GreenMetric ranking between 2020 and 2024 provides clear evidence of substantial institutional progress. The data presented in Table 3.

Over the period from 2020 to 2024, the university has demonstrated remarkable progress in advancing sustainability and transitioning from isolated green measures to the systematic implementation of a comprehensive Green Campus strategy. In 2020, the institution's sustainability profile was characterized by individual initiatives, such as energy-saving practices, partial waste recycling, and local greening projects, which resulted in a moderate overall score of 71% and a world ranking of 152nd in the UI GreenMetric. By 2024, these efforts had evolved into a coordinated institutional strategy, incorporating sustainability into infrastructure development, research, education, and community engagement.

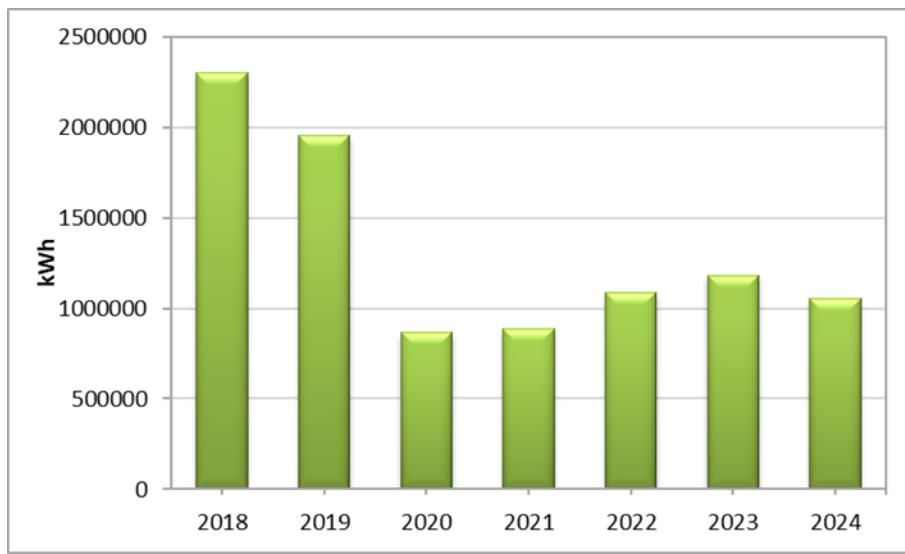


Figure 3. Changes in electricity consumption during the implementation of energy efficiency measures for buildings

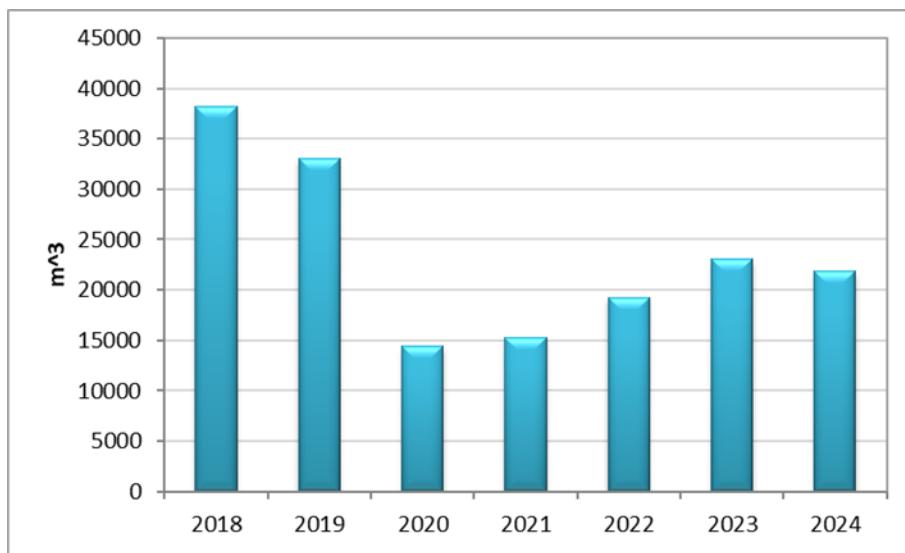


Figure 4. Changes in water consumption during the implementation of water conservation measures

The results are clearly reflected in the improved metrics: the university climbed 55 positions globally, secured the 1st place in Kazakhstan, and significantly increased its overall score to 84.75%. The most notable transformation occurred in the Education & Research category, which rose from 70.8% to 98.6%, highlighting the integration of sustainability topics into curricula, research projects, and student initiatives. Strong growth was also observed in Energy & Climate Change and Transportation, reflecting the adoption of renewable energy sources, optimization of energy use, expansion of eco-friendly mobility, and development of a low-carbon campus.



Figure 5. Analysis of KEU's place in the UI GreenMetric ranking [29]

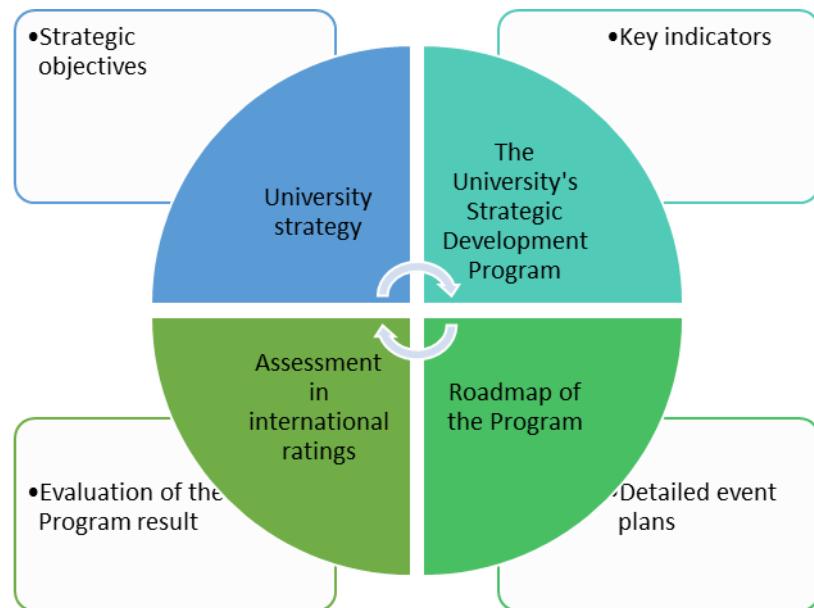


Figure 6. Systematic approach to the implementation of sustainable practices in EKTU

Despite these achievements, Water management remains the most vulnerable dimension, showing only modest progress (from 55% to 60%), which underlines the need for further investment in water-saving technologies and monitoring systems. Nevertheless, the holistic improvements across all six categories illustrate that the university has successfully shifted from fragmented green actions to a strategic institutional approach, positioning itself as a leader of sustainable campus development in Kazakhstan.

Table 3. Comparative Ranking Progress Data

Indicator	2020	2024	Differences
World Ranking	152	97	Improved by 55 positions
Total Score	7100 / 10000 (71.0%)	8475 / 10000 (84.75%)	Increase of 1375 points
Setting & Infrastructure (SI)	1200 / 1500 (80%)	1350 / 1500 (90%)	Improvement
Energy & Climate Change (EC)	1600 / 2100 (76.2%)	1850 / 2100 (88.1%)	Improvement
Waste (WS)	1125 / 1800 (62.5%)	1350 / 1800 (75%)	Improvement
Water (WR)	550 / 1000 (55%)	600 / 1000 (60%)	Slight improvement
Transportation (TR)	1350 / 1800 (75%)	1550 / 1800 (86.1%)	Improvement
Education & Research (ED)	1275 / 1800 (70.8%)	1775 / 1800 (98.6%)	Significant improvement
Number of Categories / Indicators	6 categories, ~34 indicators	6 categories, over 50 indicators (new ones in SI, EC, WR, ED)	Methodology expanded
Weakest Category	Water (55%)	Water (60%)	Remains the weakest, but improved
Strongest Category	Energy & Climate Change (76%)	Education & Research (98.6%)	Leader changed

The case of EKTU clearly demonstrates the critical importance of adopting a comprehensive green strategy in higher education institutions. The transition from fragmented initiatives to a systemic, mission-driven, and measurable sustainability framework has allowed the university to achieve substantial improvements across multiple dimensions, including energy efficiency, waste management, transportation, and especially education and research. By embedding the SDGs and GreenMetric criteria into strategic planning, EKTU has not only improved its international ranking but also strengthened its institutional culture of environmental responsibility. This evolution highlights those sustainable practices, when aligned with global standards, serve as both a driver of academic excellence and a mechanism for strengthening the university's legitimacy in the global arena. Importantly, the results indicate that sustainability is not limited to operational measures but becomes an integral part of teaching, research, and community engagement. Therefore, the integration of a green strategy is essential for universities seeking to remain competitive, socially relevant, and aligned with global sustainability goals.

4. Conclusions

This study demonstrates that developing a sustainable university strategy based on the requirements of the UI GreenMetric green ranking can serve not merely as an assessment tool, but as an effective mechanism for institutional transformation. In contrast to the previously dominant descriptive approaches to university sustainability, the work highlights

how the systematic integration of the Sustainable Development Goals into the university's strategy, mission, and operational activities can lead to steady improvement in key environmental performance indicators.

Using the example of D. Serikbayev East Kazakhstan Technical University, it is shown that even universities with limited financial resources can maintain positions in international rankings through consistent implementation of systemic and evaluative approaches, active engagement of staff and students, and adaptive strategy development in response to external feedback.

The study provides a scientific rationale for the interrelation between sustainability strategies and ranking assessment mechanisms, thereby contributing to the broader understanding of sustainable management in higher education institutions. In the future, the research will be extended to include an analysis of other sustainability ranking systems to compare criteria and examine potential differences in how sustainable practices are evaluated. Additionally, a comparative study involving other regional universities is planned to identify both universal and context-specific success factors.

Acknowledgment

The authors would like to thank all the employees of the D. Serikbaev EKTU, who have been supporting the university's green policy for seven years and helping to improve the environmental friendliness and sustainability of the campus.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Authors Contribution

S.R.: Supervision, Conceptualization, Resources, Validation, **U.N.:** Administration, Conceptualization, Resources, Validation, **O.P.:** Conceptualization, Methodology, Investigation, Formal analysis, Data curation, writing – original draft, writing – review & editing., **D.S.:** Investigation, Data curation, Writing – original draft.

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