

# Assessing Green Mindset Institutionalization in Azerbaijan's Higher Education: Evidence from UI GreenMetric and THE Impact Rankings

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*Abstract: The purpose of this article is to evaluate the institutionalization of the green mindset in Azerbaijan's higher education by analyzing long-term sustainability performance trends using UI GreenMetric World University Rankings and the Times Higher Education Impact University Rankings (THE Impact Rankings) data from 2021 to 2025. The study focused on selected universities in Baku, Azerbaijan. Data collected for this study were quantitatively examined using a longitudinal comparative approach that utilized an unbalanced panel dataset and applied descriptive trend analysis and Spearman's Rank Correlation Coefficient. The results of the article showed modest increases in UI GreenMetric rankings over the past five years, variability in THE Impact Rankings, and weak or no statistically significant correlations between universities' internal sustainability practices and their external SDG performance. The findings show that increases in internal sustainable practices do not translate into greater international awareness of universities' SDG impacts. Further, the study presents preliminary evidence of a developing yet incomplete sustainability institutionalization process in Azerbaijan's higher education system. The study contributes to exploratory evidence for the institutionalization of sustainability in higher education in Azerbaijan, indicating both progress, and persistent issues in aligning campus-based environmental management to broader sustainable development goals. Given the small sample size and methodological limitations, results are interpreted cautiously as emerging patterns rather than definitive conclusions.*

*Keywords: Sustainability, sustainable development goals (SDGs), The impact rankings, UI (Universitas of Indonesia) GreenMetric, higher education, Azerbaijani universities*

## 1 Introduction

Universities across the world are widely recognized as key players in promoting sustainable development through their core functions of education, research, campus operations, and community engagement. Beyond supporting individual environment-related initiatives, universities are expected to establish an integrated institutional commitment to sustainability, known as the institutionalization of a

"green mindset". This concept includes the incorporation of environmental awareness, sustainability values and responsible behavior into organizational structures, governing documents and educational environments [5, 15].

A sustainable "green" mindset in higher education goes beyond infrastructure improvements and operational efficiencies. It reflects institutional commitment to sustainability that shapes decision-making processes, curriculum design, research priorities, and public engagement strategies [12]. In this regard, sustainability benchmarking rankings such as the UI GreenMetric World University Ranking and the Times Higher Education (THE) Impact Ranking allow institutions to measure their progress toward achieving goals related to environmental management and the United Nations Sustainable Development Goals (SDGs). The UI GreenMetric focuses on campus-based environmental performance metrics - including energy efficiency, waste management, water usage and sustainability education- while the THE Impact Rankings examines institutional contributions towards achievement of each of the 17 SDGs, including climate action, quality education, and responsible consumption [5, 7].

Universities around the world are being pressed by a variety of stakeholders including, students, faculty, funders and governments to have tangible commitments to sustainability and to showcase their contributions to addressing complex environmental and social challenges [11]. This demand has also increased competition amongst universities to improve their position within various types of sustainability-related rankings, which can enhance institutional reputation, attract resources, and recruit high-quality students and faculty [9]. As a result, universities are increasingly investing in sustainability initiatives, research programs, and partnerships to differentiate themselves and fulfill their social and environmental responsibilities.

In the emerging sustainability context, including Azerbaijan, limited empirical evidence is available on how universities align their internal sustainability practices with external recognition of the SDGs. Azerbaijan's higher education sector is witnessing growing participation in international sustainability rankings, with the number of institutions represented in THE Impact Rankings growing from 18 to 28 between 2024 and 2025, representing 60% of all higher education institutions in the country. This participation rate is higher than the regional average of 5-35% in the South Caucasus and Central Asia, suggesting an emerging institutional commitment to sustainability reporting and assessment.

Despite greater involvement from Azerbaijan's universities in improving their sustainability, there have been few studies that examine the overall trend of sustainability performance at these institutions or the relationship between the environmental practices implemented on campuses, and their contribution to the SDGs. Therefore, it will be important to determine if improvements in institutional environmental management shown through UI GreenMetric, reflect improvements in how the institutions position themselves related to the SDGs through THE Impact

Rankings. This analysis can provide an indirect, however quantifiable measure to assess the degree of institutionalization of the green mindset in higher education.

Hence, this paper studies selected Azerbaijani universities using longitudinal data from UI GreenMetric and THE Impact Rankings from 2021 to 2025. The research focuses on seven institutions: Baku State University (BSU), Azerbaijan State Economic University (UNEC), Western Caspian University (WCU), Azerbaijan University of Architecture and Construction (AUAC), Azerbaijan State Oil and Industry University (ASIOU), Azerbaijan Technical University (ATU) and Baku Higher Oil School (BHOS). The study does not attempt to determine causal relationships instead, it examines descriptive trends and statistical associations between sustainability performance indicators and SDG positioning. This contributes exploratory evidence to thoughts surrounding sustainability institutionalization in Azerbaijani higher education and provides insights into the current stage of green mindset development within the sector.

## **2 Literature Review**

### **2.1 University Sustainability and Green Campus Initiatives**

Universities and their role in supporting sustainable development have gained academic attention in the last two decades. Higher education is now often seen not just as an educational institution but as a key agent of social transformation that can prepare future leaders, create new knowledge through research and promote sustainability [2, 12]. This expanded role is also consistent with the United Nations 2030 Agenda for Sustainable Development, which emphasizes the necessity of climate action and sustainable practices by all sectors of society.

The concept of "green campus" has emerged as a comprehensive framework for integrating sustainability into higher education operations and culture. Green campus initiatives encompass sustainable infrastructure, energy efficiency, waste management, sustainable transportation, water conservation, and environmental education [4, 5]. Research by Fachrudin et al. (2019) identified three critical factors for realizing green campuses: education, practical, and seminar activities; green campus campaigns through various media; and green applications including paperless initiatives and environmentally friendly practices. These factors demonstrated strong correlations, indicating their collective importance in raising awareness and promoting sustainability concepts within university communities.

Universities implementing green campus programs have reported significant progress in students' perception and adoption of sustainable habits, increased implementation of green infrastructures, and improved waste and resource

management [13]. Environmental education emerges as crucial for fostering ecological awareness, reducing institutions' ecological footprints, and preparing students for future environmental challenges. However, research also reveals persistent challenges in translating sustainability initiatives into systemic transformations and achieving genuine institutional commitment beyond public relations efforts [7].

The literature emphasizes that sustainable universities must integrate sustainability principles into their institutional structures, campus operations, and education-research activities across various disciplines [14]. This holistic approach requires universities to rethink their missions, restructure curricula, and integrate sustainability into all aspects of education and learning [10]. Universities are increasingly establishing sustainability centers to coordinate efforts, reduce environmental footprints, and contribute to developing green professions.

Despite growing attention to campus sustainability, studies reveal mixed results regarding the effectiveness of green campus initiatives in changing student behavior and awareness. Research by Hutcherson et al. (2013) found that community college students generally showed low awareness of campus sustainability efforts, though institutions with higher implementation levels and active promotion tended to have students with greater awareness and stronger pro-environmental attitudes. Similarly, Al-Nuaimi et al. (2022) found that while over 80% of surveyed higher education students grasped sustainability knowledge, this understanding decreased for attitudes and behaviors, with external factors such as social media and peer influence proving more impactful than traditional educational settings.

The concept of institutionalizing a "green mindset" extends beyond physical infrastructure to encompass the development of environmental consciousness, ethical awareness, and sustainable behavioral patterns among students and staff [17]. Research suggests that embedding sustainability in core courses, even in disciplines not traditionally associated with environmental studies, can effectively improve students' environmental awareness and sustainable mindset, influencing their behavior and encouraging green business ideas [17]. This finding underscores the importance of curriculum integration rather than relying solely on extracurricular initiatives or campus infrastructure improvements.

## **2.2 UI GreenMetric and THE Impact Rankings as Assessment Tools**

The spread of sustainability assessment tools and ranking systems reflects the growing demand for transparent, comparable measures of university sustainability performance. Although several methods exist to assess or rank institutional sustainability activities globally, the UI GreenMetric World University Ranking and THE Impact Rankings are currently among the most prominent global assessment models. Launched by Universitas Indonesia in 2010, the UI GreenMetric

Sustainability Assessment Tool uses six key categories to measure the level of sustainability at each participating institution: setting & infrastructure, energy & climate change, waste management, water conservation, transportation, and education. The internationally accepted benchmark provided by this ranking model is designed to encourage institutions to continually enhance their sustainability performance and share successful strategies. By 2020, more than 900 institutions from 94 countries were ranked under the UI GreenMetric program. The metrics used within the UI GreenMetric framework include physical characteristics such as campus green space ratios, energy efficient building technologies, recycling programs, water-saving initiatives, alternative modes of transportation and the integration of sustainability principles into academic curricula and research [5]. However, UI GreenMetric has faced criticism for its relative simplicity compared to other assessment systems and for requiring data types that are generally less empirical and demanding than those used in alternative frameworks. Despite these critiques, the ranking has proven valuable in promoting sustainability awareness and facilitating international comparisons of university environmental performance [17].

THE Impact Rankings, launched in 2019, provide a global assessment of universities' contributions to the SDGs using a range of indicators including research output, teaching quality, knowledge transfer, and societal engagement [7]. The rankings evaluate performance across all seventeen SDGs, with universities required to submit data on SDG 17 (Partnerships for the Goals) and at least three additional SDGs of their choice. The methodology employs a weightage system to calculate overall scores, which are then used to create global rankings and SDG-specific rankings. This approach allows universities to showcase their strengths in particular sustainability domains while providing a comprehensive view of their overall SDG contributions. THE Impact Rankings are very different from other types of rankings of academia because they rank universities based on how well those universities can positively affect society and contribute to a more sustainable world, versus being ranked primarily based on the quality of research produced by that institution and its academic reputation. The changing focus is indicative of the change in the way we view higher education, where the social missions of institutions are becoming equally important as the historic roles of teaching and research [16]. THE Impact Rankings have become increasingly recognized as useful tools for measuring universities' impacts in terms of improving the environment; economically; and socially, and measuring them against SDGs.

Both ranking systems provide complementary assessments of university sustainability. UI GreenMetric focuses primarily on campus-level environmental management and operational sustainability. It provides quantifiable measures of the physical aspects of campuses and resources used by an institution. In contrast, THE Impact Rankings assesses the broader societal contributions and commitments of universities towards achieving SDGs through research outputs, educational programs, and community engagements focused on contributing to sustainable

development. The relationship between performance in these two systems offers insights into whether universities' internal sustainability practices align with their external SDGs contributions and visibility. Research examining the effectiveness of these ranking systems reveals mixed findings. While participation in rankings can motivate institutions to implement sustainability initiatives and track progress over time, rankings alone do not guarantee increased awareness or behavioral change among students and staff [17]. Furthermore, ranking methodologies may reflect participation patterns, reporting practices, and methodological changes across years, necessitating careful interpretation of results.

### **2.3 University Social Responsibility and Sustainable Development**

The concept of University Social Responsibility (USR) has emerged as a framework for understanding higher education institutions' obligations to contribute to sustainable development and societal well-being. USR extends the principles of corporate social responsibility to the academic context, emphasizing universities' ethical responsibilities to minimize their ecological footprints, promote social equity, and contribute to economic development [3]. Universities' social responsibility encompasses their primary functions of research, teaching, and community service, through which they must increase their interdisciplinary focus and encourage critical thinking and effective citizenship [3]. As arguably the most important societal institution, universities play a crucial role in developing citizens capable of contributing politically, socially, culturally, and economically to just and progressive societies. Furthermore, universities are entrusted with molding global citizens who can contribute to achieving the SDGs. The integration of sustainability into university missions reflects a recognition that higher education institutions serve as centers of strategic rotation within educational systems and cornerstones of sustainable development, particularly in the globalized era [3]. This recognition stems from universities' multiple tasks and their continued importance in forming qualified human capital. Universities are expected to ensure dignified living conditions with regard to human rights by creating and maintaining the widest possible range of options for freely defining life plans, taking into account principles of fairness among and between present and future generations in the use of environmental, economic, and social resources.

The literature has shown that a university's responsibility is to serve as an agent of change for all sustainability-related issues, as well as be a place where students develop their awareness and skills to deal with future problems [10]. This role requires to establish sustainability through policy and practice, and train their graduates to become sustainability advocates. Programs and courses relating to environmental sustainability have experienced exponential growth along with growing interest in on-campus sustainability initiatives and incorporating sustainability across diverse disciplines. In addition to highlighting the importance

of stakeholder engagement, sustainable funding models, and the barriers to incorporating sustainability into existing academic processes [2], the literature also notes that operational changes, such as improving energy efficiency or reducing waste, are typically less difficult than changing curricula and research agendas. Developing a collaborative framework through alliances and networks will provide mechanisms for knowledge transfer, resource allocation and collective advocacy for sustainability in higher education.

In the context of Azerbaijan, the higher education sector's engagement with sustainability remains an emerging area of practice and research. As Azerbaijani Universities become increasingly involved in International Sustainability Rankings, it would appear that there is a greater awareness at the institutional level regarding sustainability as well as the desire to use these rankings as benchmarks of global standards. However, the extent to which Azerbaijani Universities are engaging in actual institutional transformation versus merely symbolic compliance with current international trends needs to be researched empirically. Understanding the alignment between universities' internal sustainability practices and their external SDG positioning can provide insights into the depth and authenticity of sustainability institutionalization in the Azerbaijani context.

### **3 Data and Methodology**

#### **3.1 Research Design**

This study used a longitudinal comparative quantitative design using secondary data collected from two global sustainability ranking systems: the UI GreenMetric World University Ranking and THE Impact Ranking. The comparison was conducted with respect to Azerbaijani universities that had publicly available ranking data throughout the period from 2021 to 2025. The size of the dataset differs because there are variations in how many institutions participated in each year and ranking system; therefore, this is considered an unbalanced panel where different universities having data available for different time periods.

The study is exploratory in nature and does not aim to establish causal relationships between variables. Instead, it evaluates whether patterns of institutional sustainability performance, as measured by UI GreenMetric indicators, align with SDG-related impact positioning captured by THE Impact Rankings. This alignment is interpreted as an empirical proxy for universities' green mindset institutionalization—a systemic institutional commitment to sustainability that manifests in both internal environmental practices and external contributions to SDGs.

## 3.2 Data, Data Sources and Measures

### 3.2.1 Institutional Sustainability Performance

UI GreenMetric overall scores and category-level scores were used to measure campus-level environmental management and sustainability practices. The category scores include:

- **Energy and Climate Change:** Measures related to energy efficiency, renewable energy use, and climate action policies
- **Waste Management:** Indicators of waste reduction, recycling programs, and waste treatment practices
- **Water Conservation:** Metrics assessing water use efficiency and conservation initiatives
- **Education and Research:** Measures of sustainability integration in curricula, research output, and educational programs

Figure 1 represents the data obtained from the official website of the UI GreenMetric World University Rankings for seven Azerbaijani universities for a selected time period.

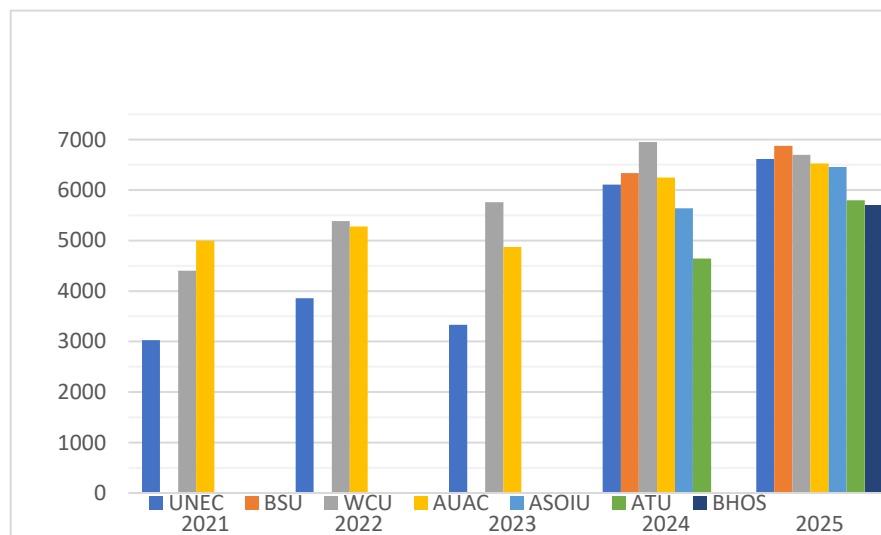


Figure 1

Trend in UI GreenMetric overall scores for selected Azerbaijani universities (2021–2025)

### 3.2.2 SDG and Impact Positioning

THE Impact Rankings overall bands and SDG-specific bands were used to capture universities' broader contributions to sustainable development. Because THE Impact results are reported as bands (e.g., 401-600, 801-1000, 1001+) rather than precise ranks, all bands were converted into ordinal numeric values using the lower bound of each band (e.g., 401-600 → 401; 1001+ → 1001). This conversion preserves the ordinal ranking structure without assuming interval-scale distances between positions. For interpretability in correlation analyses, an "impact performance" variable was defined as the negative of the rank value, such that higher values indicate better performance.

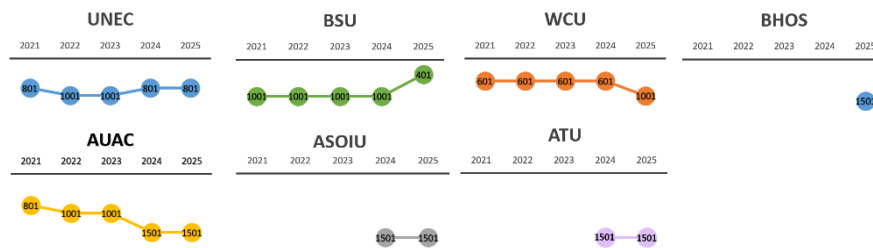


Figure 2

THE Impact Overall Band Trends for Selected Azerbaijani Universities (2021–2025)

Figure 2 demonstrates the overall impact ranking results of universities over a 5-year time frame collected from the official website of The Impact Rankings.

### 3.2.3 Sample and Data Availability

The sample comprises seven Azerbaijani universities. These are Azerbaijan State Economic University (UNEC), Baku State University (BSU), Western Caspian University (WCU), Azerbaijan University of Architecture and Construction (AUAC), Azerbaijan State Oil and Industry University (ASIOU), Azerbaijan Technical University (ATU) and Baku Higher Oil School (BHOS). The final dataset contains 35 university-year observations across the 2021-2025 period. Data availability varied by year and institution due to gaps in ranking participation and publication. Due to variation in ranking participation across institutions and years, the dataset constitutes an unbalanced panel. This unbalanced panel structure reflects the reality of participation patterns in rankings, where universities may enter or exit ranking systems based on institutional priorities, resource availability, and strategic decisions. All available observations were retained in the analysis to maximize the use of existing data. For correlational analyses, pairwise deletion was applied to ensure that only complete cases for the variables under examination were included in each specific analysis.

### 3.3 Methodology

Methodology designed with the objective of conducting an integrative evaluation that would provide a reasonable but cautious examination of patterns related to sustainability performance for each of the universities included in this study.

#### 3.3.1 Descriptive Trend Analysis

Descriptive statistics and trends were created from the descriptive data to compare changes in the UI GreenMetric Overall Score, Category Scores, and THE Impact Positioning over time. The intention was to determine whether trends in specific sustainability performance indicators improved.

#### 3.3.2 Spearman Rank Correlation Analysis

Spearman's Rank Correlation analysis was selected to measure the relationships among the various UI GreenMetric Indicators and the THE Impact Positioning because of the following reasons. First, the ranking data was ordinal. Secondly, a small sample size makes use of non-distributional properties advantageous. Thirdly, no assumptions of linearity or normality are required. Correlations were compared at two levels:

**General Alignment** - GreenMetric Overall Score compared to THE Impact Performance.

**Category to SDG Alignment** - Specific GreenMetric Categories (Energy, Water, Education, and Waste) in comparison with Correspondingly Ranked SDGs (SDG 7-Affordable and Clean Energy, SDG 6- Clean Water and Sanitation, SDG 4- Quality Education, and SDG 12- Responsible Consumption and Production).

$$\rho = 1 - 6 \sum d_i^2 / n(n^2 - 1) \quad (1)$$

In this equation (1),  $\rho$  represents the Spearman rank correlation coefficient,  $n$  is the number of paired observations and  $d_i^2$  is the difference between the ranks of paired observations. Pairwise deletion was incorporated to maximize the number of valid observations used in each correlation due to the unbalanced panel structure of the data. Statistical correlation significance was applied at the 5% significance level ( $\alpha = 0.05$ ), though results are interpreted cautiously given the exploratory nature of the study and the small sample size.

## **4 Findings**

### **4.1 Ranking Participation Patterns**

Participation by Azerbaijani universities within international sustainability ranking systems has shown a significant increase. According to the Ministry of Science and Education of the Republic of Azerbaijan, in terms of THE Impact Rankings, there was an increase in participation from 18 Azerbaijani Institutions in 2024 to 28 in 2025; that is about 60 % of all Higher Education Institutes in Azerbaijan. The relatively high level of participation among Azerbaijani Institutions far exceeded the regional average for the South Caucasus and Central Asia, which ranged from 5- 35%.

Among the seven universities surveyed by this research study, UNEC, BSU, WCU, and AUAC participated in THE Impact Rankings each year from 2021 to 2025. Therefore, they provided full data on their global ranking for a total of five years. The remaining three universities participated as follows: ASOIU and ATU first entered THE Impact Rankings in 2024, while BHOS first participated in 2025. Furthermore, the participation patterns of the seven universities in UI GreenMetric were variable. WCU, AUAC and UNEC remained consistently engaged in the reporting process during each of the five years studied, suggesting a strong commitment to developing an institutional-wide sustainability report. In contrast, BSU, ASOIU and ATU did not participate until 2024 and BHOS attended only in 2025. It remains to be seen if these universities will continue to emphasize environmental reporting at their institutions or make strategic decisions about when to submit reports.

The variation of university rankings for participant status represents a larger trend for sustainability at the university level, as universities can select to use varying assessment frameworks based upon what is most strategic for each institution, how many resources are available and whether or not there is an alignment with existing university strengths. As such, it appears that participating in THE Impact Ranking is viewed as either strategically more beneficial or easier to implement compared to collecting more specific data regarding environmental practices at the campus level for GreenMetric.

### **4.2 GreenMetric Performance Trends**

Analysis of the trends in UI GreenMetric overall scores by institutions indicates that most of the trends are generally positive but do not follow a linear trend in institutional sustainability performance over time. These trends vary across universities, reflecting different paths taken on their journey toward sustainable development.

UNEC experienced an impressive rise throughout the five years under review. However, it is also subject to annual variations. Between 2021 and 2025, UNEC's total scores increased by 118.6%, increasing from 3025 points in 2021 to 6613 points in 2025. The sizeable and consistent improvement in UNEC's scores indicates that UNEC has made major investments in its sustainability infrastructure, policies, and practices over the course of this five-year study.

WCU exhibited strong and consistent results during this evaluation. The overall result for WCU improved dramatically, increasing from 4400 points in 2021 to its highest (6950) in 2024, then decreased slightly to 6700 points in 2025. This placement was second nationally and 546th internationally according to the data. As mentioned earlier, the small decrease in rankings from 2024 to 2025 could be due to the new methodological approach used by GreenMetric in evaluating each institution's sustainability; differences in the reporting methodologies among universities evaluated; or actual changes in the sustainability performance metrics used by these universities.

BSU, ASOIU and ATU have shown a significant development over the last two years in the GreenMetric rankings. From 2024 to 2025, the total number of points on the GreenMetric index increased by 540 points (approximately 8.5%) for BSU, 818 points (approximately 14.5%) for ASOIU and 1153 points (approximately 24.8%) for ATU. In 2025, BSU took 493rd position among all participants of the GreenMetric worldwide and was ranked in first place in the national ranking. The universities performed relatively well in some categories of the GreenMetric but also have potential for further development in other categories.

Overall, the descriptive trends indicate non-linear yet mostly positive improvements in institutional sustainability performance of those universities continuously participating in GreenMetric evaluations. There is significant variability in the degree of positive trend across each institution. For example, UNEC showed the greatest increases, which may have been related to their sustainability development efforts.

### **4.3 THE Impact Positioning Patterns**

THE Impact Rankings positioning exhibited considerable year-to-year variability across universities, with patterns of both improvement and decline observed during the study period.

UNEC maintained relatively stable positioning in the middle-to-lower bands throughout most of the observation period. The institution's overall band fluctuated between 801-1000 and 1001+, with positioning at the 801-1000 level in 2025. This stability suggests consistent but moderate performance in SDG-related indicators, without the dramatic improvements observed in the institution's GreenMetric

scores. The institution ranked second nationally in the 2025 THE Impact Rankings alongside BHOS, both achieving the 801-1000 band.

Beginning with WCU, there was an indication that the university experienced a period of stability at first, then a decline. WCU positioned itself within the 601-800 band for the years of 2021 through 2024. The university positioned itself in this manner, indicating that it performed relatively well compared to other Azerbaijani universities. In contrast, however, the position of WCU dropped to the 1001+ band in 2025. A significant loss in relative position to others occurred when WCU's position changed. Although WCU had excellent results on the UI GreenMetric rankings as indicated previously.

In comparison to other universities, BSU showed significant positive movement upward in its overall impact position. In terms of bands in which an institution is ranked in the 2021 - 2024 time frame, BSU was consistently placed in the "1001+" band (the lowest reported band). For 2025, however, BSU moved to the "401-600" band. Thus, BSU has shown a significant increase in relative positioning. From being at the lower end of the spectrum for participating institutions, it has moved up to be in the higher middle range.

AUAC's THE Impact Rankings were positioned in a relatively low performance range from 2021 through to 2025. The rankings ranged from 801 to 1501. In 2021, AUAC achieved the highest ranking of 801. Then there was a downturn to 1001 for both 2022 and 2023. Finally, AUAC experienced an additional decline to 1501 for both 2024 and 2025. Therefore, it appears that the overall trends indicate decreased international visibility in sustainability-related performance over the observation period.

Both ASOIU and ATU had an identical THE Impact Rankings position of 1501 for both years (2024-2025). Therefore, it can be stated that while both universities are at a stable ranking, their overall rankings are relatively low. There was no identifiable upward or downward movement from the data collected.

The variability of the year-to-year SDG rankings and the variable degree of improvement or decline does not always correlate with GreenMetric university performance metrics. This could be due to a variety of factors such as, the change in the method used to determine the rankings, variations in the quality and accuracy of the information provided by each institution when submitting their data, an increase in competition from other institutions participating in the rankings and actual fluctuations in research output and campus SDG related efforts.

#### **4.4 Alignment Between GreenMetric and THE Impact Rankings**

Spearman Rank Correlation Coefficients were used to investigate whether there is a statistical relationship between each of the UI GreenMetric Performance

Indicators and THE Impact Ranking's Positioning, examining both overall alignment and category-to-SDG correspondences. Table 1 below demonstrates the results.

| Variable Pair                         | $\rho$ | p     | n  |
|---------------------------------------|--------|-------|----|
| Greenmetric Overall vs Impact Overall | 0.197  | 0.539 | 23 |
| Energy vs SDG 7                       | 0.205  | 0.596 | 14 |
| Water vs SDG 6                        | 0.019  | 0.968 | 12 |
| Education vs SDG 4                    | -0.330 | 0.332 | 21 |
| Waste vs SDG 12                       | -0.645 | 0.239 | 7  |

Table 1.

Spearman Correlations Between GreenMetric Variables and SDG Performance

**Overall Alignment:** There was a weak non-statistically significant association between an institution's Overall GreenMetric Score and its THE Impact overall performance ( $\rho = 0.197$ ;  $p = 0.539$ ;  $n = 22$ ). The result of this investigation implies that when examined across the available data set, institutions performing at a high level on campus-wide sustainability issues as assessed through GreenMetric do not generally have corresponding high positions in THE Impact Rankings. This result would indicate that the available rankings measure different types of institutional sustainable practices.

**Category-to-SDG Alignment:** The association between categories of campuses and their corresponding Sustainable Development Goals (SDGs) was found to be weak across the majority of analyses of theoretically matching category-SDG pairs:

**Energy vs. SDG 7 (Affordable and Clean Energy)** - The correlation was weak and was not statistically significant ( $\rho = 0.205$ ,  $p = 0.596$ ,  $n = 14$ ). Although there is theoretical alignment between GreenMetric's energy and climate change categories and SDG 7, the sample showed that institutions do not statistically relate their performance on those aspects of sustainability.

**Water vs. SDG 6 (Clean Water and Sanitation)** - The correlation was negligible and non-significant. There were virtually no relationships between water related campus activities and the position of the institution regarding SDG 6 ( $\rho = 0.019$ ,  $p = 0.968$ ,  $n = 12$ ).

**Education vs. SDG 4 (Quality Education)** - The relationship was weak-to-moderately negative and not statistically significant ( $\rho = -0.330$ ,  $p = 0.322$ ,  $n = 21$ ). However, the negative trend could suggest that the higher a university scored for GreenMetric education categories they had poorer positions concerning SDG 4, suggesting an inverse relationship.

**Waste vs SDG 12 (Responsible Consumption and Production)** - The study found there is an overall moderate-to-very strong negative relationship ( $\rho = -0.645$ ;  $p =$

0.239;  $n = 7$ ) between Waste Category and SDG 12 ranking performance. Therefore, it appears that for the data provided, high Waste Category scores are related to lower levels of SDG 12 ranking performance. However, the relationship did not reach statistical significance level. Due to the extremely low number of paired cases examined in this study, these results should be approached with extreme caution and viewed as exploratory only.

The data limitations (e.g., limited number of observations), the unbalanced nature of the panel, and the fact that multiple comparisons were made to evaluate relationships in a single study suggest that these correlational patterns can only be viewed as preliminary and require confirmation using larger and more robust datasets. Overall, the majority of non-significant correlations found in this analysis indicate that there does not appear to be an obvious relationship between campus sustainability practices and positioning relative to Sustainable Development Goals using these two metrics for this particular time frame.

## 5 Limitations

The results of this research have to be seen in conjunction with significant methodological restrictions in terms of the application of conclusions and their generality.

**Sample Size and Statistical Power:** With only seven universities examined over the course of five years, there were at most 35 different combinations of university year available for analysis and many fewer for specific analyses due to missing data. Therefore, given its very low number, the sample size restricts the statistical power of all analyses. As such, the likelihood of both Type II error (not detecting a true association), and Type I error (finding a false relationship) is increased. The low sample size makes it difficult to do advanced statistical model development that could control for confounding variables or examine complex interaction effects.

**Unbalanced Panel Structure:** Due to varying degrees of data availability for each university and each year of observation, the data is structured in an unbalanced panel format. An unbalanced panel complicates interpretations because some universities entered the GreenMetric rankings for the first time only in 2024. Thus, longitudinal comparisons can only be made on the basis of other remaining institutions. This imbalance may introduce bias if the universities with complete data differ systematically from those with partial data in ways that affect sustainability performance trajectories.

**Ranking-Based Constructs:** To estimate various sustainability concepts, this study uses ranking positions and scores. In addition to the actual performance of an institution regarding sustainability, rankings include aspects related to participant behavior (which institutions participate); reporting behavior; methodology changes

in ranking systems over time; and who is included within the comparison group. Changes in ranking position may result from factors other than genuine changes in institutional sustainability practices, including variations in which institutions participate, modifications to ranking methodologies, and differences in data quality and completeness across submission cycles.

**Limited Generalizability:** Although the study is limited to seven universities in Azerbaijan over a particular five-year period, the findings are not generalizable to other institutions, countries, or time periods without further research. There are many factors that distinguish the Azerbaijani higher education environment such as, structural elements of institutions, environmental regulations, resource constraints and cultural considerations, that may influence trends in sustainability performance differently than similar factors operating in other settings.

**Correlational Study Design:** The study's correlational and descriptive design precludes causal inferences about relationships between variables. While the analysis examines associations between GreenMetric performance and THE Impact positioning, it cannot determine whether improvements in campus-level sustainability cause changes in SDG positioning, whether both are driven by common underlying factors, or whether the relationship is spurious.

**Time Period:** The five-year observation period provides a useful longitudinal view; however, it is relatively short-term for assessing long-term transformational processes within an institution. Institutionalizing sustainability is a long-term process that can take decades to become fully established, and thus trends identified over a five-year period may not reflect long-term trends.

**Measurement Validity:** The extent to which UI GreenMetric and THE Impact Rankings validly measure the construct of "green mindset" remains an open question. These rankings capture observable indicators of sustainability practices and SDG contributions, but may not fully reflect the depth of institutional commitment, cultural transformation, or systemic integration of sustainability principles that constitute a genuine green mindset.

These limitations underscore the exploratory nature of the study and the need for caution in interpreting findings. The results should be viewed as preliminary evidence of emerging patterns rather than definitive conclusions about sustainability institutionalization in Azerbaijani higher education.

## 6 Recommendations for Universities of Azerbaijan

Despite the limitations noted above, it is possible to outline some concrete suggestions for Azerbaijan-based institutions of higher education to intensify the institutionalization of the green mindset across institutional dimensions.

**Enhance Strategic Alignment Between Operational and Impact Dimensions:**

The weak correlations between GreenMetric performance and THE Impact positioning suggest that universities have an opportunity to develop more inclusive and integrated sustainability plans connecting on-campus environmental actions with educational opportunities, research projects, and community outreach/engagement projects that address the SDGs. Sustainability offices should collaborate and coordinate amongst operational, academic, and research domains so that the investment in new facilities translates into educational opportunities, research projects and social impacts recognized within a more comprehensive sustainability review.

**Strengthen Sustainability Data Infrastructure and Reporting Capacity:**

To consistently participate in multiple ranking systems, universities need to have robust systems for collecting, documenting, storing, and disseminating data related to sustainability. Therefore, this type of data documentation system will allow universities to track their own progress towards becoming more sustainable and to communicate their progress to internal and external stakeholders regarding sustainability performance.

**Integrate Sustainability Across Curricula and Research Programs:**

Although improving campus operations (energy use, waste management, water conservation) is a critical component of enhancing sustainability performance at universities, findings suggest that universities should also focus on integrating sustainability into educational programs and research activities. This integration should extend beyond environmental science and engineering to encompass social sciences, humanities, business, and professional programs, ensuring that all graduates develop sustainability competencies relevant to their fields.

**Development of Long-Term Sustainability Plans:**

The non-linear nature of sustainability performance improvements observed in the data suggests that universities should develop comprehensive, long-term sustainability roadmaps with clear milestones, targets, and accountability mechanisms. These roadmaps should be reviewed and updated annually using available data to assess performance and changes in institutional priorities.

**Inter-Institutional Cooperation and Learning:**

The variability in sustainability performance among the universities provides many opportunities for inter-institutional cooperation and learning. Azerbaijani universities should consider establishing a national sustainability consortium or network to share best practices, coordinate data collection efforts, pool resources for sustainability initiatives, and collectively advocate for supportive policies and funding. Such collaboration could accelerate sustainability institutionalization across the sector while reducing duplication of effort.

**Involvement of Stakeholders in Sustainability Decision-Making Processes:**

Effective institutionalizing of sustainability at universities requires the involvement of diverse stakeholders, including students, faculty, staff, administrators, alumni

and community partners. Universities should establish participatory governance structures for sustainability, such as sustainability committees with broad representation, student sustainability councils, and mechanisms for incorporating stakeholder input into sustainability planning and decision-making.

**Supporting Faculty Research in Sustainability Topics:** The findings indicate that operational excellence in sustainability alone does not necessarily equate to high performance in research weighted SDG rankings. Universities should support building research capacity in topics related to sustainability and SDGs, encourage faculty members to conduct research in these areas, and create incentives for interdisciplinary research teams focused on addressing sustainability local and global challenges.

**Communicate Sustainability Achievements Strategically:** Universities should develop comprehensive communication strategies to promote and highlight their sustainability achievements both internally and externally. This includes not only reporting to ranking organizations but also communicating with prospective students, faculty, funding agencies, policymakers, and the broader public about sustainability initiatives, research contributions, and educational programs. Strategic communication can enhance institutional reputation, attract resources, and inspire broader societal engagement with sustainability.

**Monitor and Evaluate Sustainability Initiatives:** Universities should implement systematic monitoring and evaluation frameworks to assess the effectiveness of sustainability initiatives, identify areas for improvement, and demonstrate accountability to stakeholders. This should include both quantitative metrics aligned with international frameworks and qualitative assessments of cultural change, stakeholder engagement, and institutional transformation.

## Conclusion

The longitudinal analysis of the sustainability performance of Azerbaijan universities from 2021 to 2025 demonstrates that the higher education sector in Azerbaijan is in the early stages of institutionalizing a green mindset. There are several trends that have been identified during this longitudinal research project.

First, participation in international sustainability ranking systems by Azerbaijani universities has increased significantly, showing an increase in awareness of sustainability at the institutional level and an increased level of engagement by institutions with global benchmarking frameworks for sustainability. Second, results of UI GreenMetric demonstrated generally positive, though non-linear progress in campus-level sustainability practices over time. These results suggest ongoing investments in environmental infrastructure, policies, and management at the university level. Third, The Impact Rankings demonstrated fluctuations across institutions and years, reflective of the dynamic nature of reporting quality and competitive benchmarking conditions related to SDGs.

Moreover, the research identified weak or statistically insignificant relationships between greenmetric performance and the impact positioning across most overall category comparisons. This suggests that improvements in campus sustainability practices are not consistently being translated into stronger external recognition of broader contributions to SDGs.

Overall, the findings indicate that Azerbaijani universities have made progress toward incorporating sustainable practices into their institutional structures, however, the incorporation of sustainable practices remains both partial and unequal. Although significant improvements have occurred with respect to operational sustainability and international participation, greater integration among different aspects of governance, academic programs, research and social impact will be required for institutions to develop as truly sustainable organizations. The study contributes initial empirical evidence on sustainability development in Azerbaijani higher education and highlights the importance of a more comprehensive and coordinated approach to embedding green mindset principles across institutional dimensions.

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