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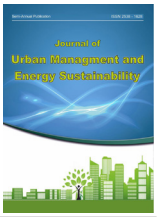

CASE STUDY RESEARCH PAPER

The role of academic performance of universities in sustainability with an emphasis on Green Metric evaluation components (Case study: Iranian universities)

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ABSTRACT

In the contemporary context, the imperative to address climate and environmental challenges has prompted universities worldwide to prioritize sustainability in their operational frameworks. Notably, numerous universities in Iran have taken significant strides towards incorporating sustainable practices into their academic systems. This research endeavors to scrutinize the nexus between the scientific and environmental performances of universities in Iran, posing the fundamental question: "Is there a discernible relationship between sustainability and academic performance in universities?"

To investigate this, data from five university ranking systems were aggregated. Employing linear regression analysis, the study aimed to elucidate the correlation between sustainability and scientific performance. The ensuing results were juxtaposed against analogous research studies conducted previously. The findings indicate that the Green Metric ranking system exhibits a minimal correlation with ARWU (R2=0.034) and THE (R2=0.0278). This is attributed to the predominant focus of these systems on quantitative metrics such as the volume of studies, references, and scholarly contributions. In contrast, a more substantial correlation was observed with QS (R2=0.2282). Intriguingly, NTU displayed a stronger correlation with the Green Metric ranking system (R2=0.2562), albeit in a negative direction. In summation, the research posits that the scientific performance of universities in Iran may not necessarily reflect their environmental performance.

This discrepancy is elucidated by the nuanced impact of factors such as the geographical location, age, and historical context of a university, which emerge as pivotal determinants influencing both scientific and environmental rankings. Consequently, any comprehensive assessment in this realm necessitates a nuanced consideration of these contextual variables.

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INTRODUCTION

The term "green" has found application across various domains, including energy, agriculture, manufacturing, and machinery. Its broader application extends to the concept of the "green economy." In higher education, the term gained prominence in the early 1990s with the emergence of the idea of "greening universities." By the early 2000s, and particularly after 2010, the terminology evolved to encompass more specific concepts such as the "green university" and "Green Campus." This evolution continued over time, leading to the emergence of the "Green Curriculum" as a more nuanced and detailed expression of sustainability in education (Atici et al., 2021).

In the era marked by the quantitative expansion of universities, there is a pressing need to reassess the design of university campuses and open spaces in light of new approaches. The sustainability of these campuses is particularly crucial, as they serve as models for impactful sustainable initiatives that decision-makers and designers can subsequently apply (Sart, 2023). Due to their size and the significant influence of their activities on both the environment and society, universities and campuses are often conceptualized as "small cities" with the aim of achieving sustainability (Leon et al., 2020). University buildings play a significant role in energy consumption due to their population and activities (Yadegaridehkordi & Nilashi, 2022)the term green building technology has progressively been used to control sustainability matters and to develop standards that can control carbon emissions and energy consumptions. University buildings are not excluded from the energy conservation problems due to their population and activities. Consequently, this study intended to find and prioritize the criteria, sub-criteria, and the associated indicators based on their level of importance in assessing green building universities in Malaysia. Based on the green building index (GBI. Consequently, universities possess both the capacity and responsibility to advance sustainable development goals at the local, national, and international levels through active dialogue and participation (Australia/Pacific SDSN, 2017). In response to heightened awareness regarding sustainability and environmental concerns, universities have become actively involved in research and the enhancement of their campus infrastructure to foster a more environmentally friendly atmosphere. Furthermore, they are aligning their study programs with this ethos by incorporating courses focused on environmental and sustainability topics, thereby emerging as champions of environmental sustainability. The role of the university in advancing sustainable development is widely acknowledged, with the university campus considered an ideal environment for both exploring and implementing sustainability practices (Disterheft et al., 2013)contributing to the paradigm shift toward a more sustainable present and future. Campus sustainability-commonly understood in a broad sense that includes the physical, educational (teaching, curricula, research. There is a belief that universities possess the ability to anticipate change and initiate relevant actions in response. Some argue that higher education carries a societal responsibility, particularly in the context of sustainability. Concurrently, certain scholars argue that a sustainability assessment can serve as a perspective for effecting organizational change toward sustainability (Lauder et al., 2015). University campuses function as intricate systems where educational and research processes unfold, accompanied by the consumption of materials, energy, and water. Notably, in China, the education sector accounts for 40% of the total electricity consumption within the public sector (Yuan et al., 2013).

Hence, there is a growing emphasis on studies aimed at mitigating anthropogenic effects within university settings. Presently, universities not only strive for scientific success and reputation but also compete to minimize their human impact on environmental issues, including climate change. In this context, the Global

University Ranking by Green Metric was introduced in 2010 by the University of Indonesia. This ranking serves as a measure to assess and estimate the sustainability ranking of higher education institutes and universities worldwide. Initially, a total of 95 universities worldwide participated in the Green Metric ranking. By 2021, this number has surged to 956 campuses. Acknowledging the significance and role of universities in societal sustainability, this article investigates the performance and efficiency of Iranian universities within the realm of sustainability, with a specific focus on the Green Metric rating system.

Sustainability in Higher Education Institution

In the modern era, the surge in the Earth's population and the subsequent increase in energy consumption have compelled societies worldwide to grapple with air pollution. Climate change, global warming, and the rise of environmental pollutants emerge as primary drivers propelling contemporary societies, especially universities, to advocate for clean energy and environmental preservation. Against this backdrop, a significant global initiative took place in 1990 to delineate the concept of a sustainable university through the Talvers statement. Leaders from 22 universities convened in Talvers, France, that year to express concerns about the state of the world and draft a document outlining essential actions required by universities to construct a sustainable future (Clugston & Calder, 2000). In this statement, recognizing the scarcity of experts in environmental management and related fields, coupled with a limited understanding among professionals from other disciplines regarding their environmental and public health impact, the role of universities is articulated as follows: Universities are entrusted with the task of educating individuals who will construct and oversee the institutions shaping society. Consequently, universities play a crucial role in fostering awareness, disseminating technological knowledge, and providing the tools necessary to construct a future that is environmentally sustainable (Clugston & Calder, 2000). Subsequently, in 2005, a consortium named HEASC (Higher Education Associations Sustainability Consortium) was established with the objectives of fostering collaboration in the realm of public education and the development of sustainable education (Marcolini, 2017). This consortium is overseen by a larger organization known as the Association for the Advancement of Sustainability in Higher Education (AASHE) (Khan & Henderson, 2020)but these commitments often do not result in the desired changes. Recognizing the importance of changes in the education system, the Association for the Advancement of Sustainability in Higher Education set the goal that by the end of 2010, 10% of all courses offered in Higher education institutions in the United States will help students understand the concept of sustainability. As per requirements, Western Michigan University has created its own criteria for sustainability-focused courses and designated 53 courses as sustainability-focused. This research study investigates whether and how instructors are implementing sustainability education in these courses and the extent to which this follows the institutional sustainability education policy and its objectives. The qualitative study involved 16 instructors of 16 sustainability-focused courses. According to course syllabi none of the sustainability-focused courses fully met the Western Michigan University criteria for sustainability-focused courses. Less than half (N = 7. In 2006, the Sustainability Consortium of Higher Education Associations, mindful of prevailing conditions, underscored the imperative for a comprehensive ranking system for sustainable universities. Such a system should be adept at addressing diverse facets of sustainability and the myriad activities of university complexes, encompassing infrastructure management, education, engagement, guidance, and community outreach. In response to this need, the association introduced the Sustainability Tracking, Assessment & Rating System (STARS). Derived from global experienc-

es and various university ranking systems, this model offers a framework for comprehending sustainability across all aspects of the academic environment. Simultaneously, it facilitates the comparison of each university's status with others and fosters international collaboration (Nazarpoor, 2016). In 2010, the University of Indonesia, positioning itself as a globally emerging university, introduced an online "green" ranking of universities worldwide. The initiative aimed to offer an overview of the prevailing conditions and policies pertaining to green campuses and sustainability across global universities. Notably, this system departed from conventional research and educational indicators, placing greater emphasis on environmental metrics. As a result, the Green Metric rating assumes a distinctive role compared to other surveys, scorecards, and sustainability rating systems (Hazelkorn, 2013). Various studies have delved into the assessment of sustainability and the use of diverse ranking tools in universities. In this regard, Shriberg (2005) examines the criteria of several evaluation tools, providing insights into the status of sustainability performance. From this analysis, he emphasizes several critical considerations, including the reduction of consumption, the pivotal role of sustainability education, inter-functional and inter-organizational integration, and the significance of incremental and systemic improvement. It's essential to recognize that rankings and indicators constitute just one aspect of sustainability evaluation within universities (Shriberg, 2005). Pope et al. (2004) undertake a comparative analysis of diverse sustainability assessment approaches to evaluate their potential contributions to sustainability. They observe that many indicators examined fall under the category of integrated assessment, originating from environmental impact assessment (EIA) or strategic environmental assessment (SEA), and have expanded to encompass social and economic considerations. The authors emphasize that a robust definition of sustainability is social for effective sustainability assessment. Furthermore, they advocate for principles-based approaches in developing sustainability criteria, considering them more suitable than alternative methods (Pope et al., 2004)this is a new and evolving concept and there remain very few examples of effective sustainability assessment processes implemented anywhere in the world. Sustainability assessment is often described as a process by which the implications of an initiative on sustainability are evaluated, where the initiative can be a proposed or existing policy, plan, programme, project, piece of legislation, or a current practice or activity. However, this generic definition covers a broad range of different processes, many of which have been described in the literature as 'sustainability assessment'. This article seeks to provide some clarification by reflecting on the different approaches described in the literature as being forms of sustainability assessment, and evaluating them in terms of their potential contributions to sustainability. Many of these are actually examples of 'integrated assessment', derived from environmental impact assessment (EIA.

Boer (2013) delves into a discussion and critique of the concepts of sustainable development and education for sustainability. In his examination, he scrutinizes various evaluation models. Additionally, certain studies propose innovative approaches for crafting evaluation systems capable of achieving social objectives (Boer, 2013).

Numerous case studies delve into the integration of sustainability in universities. Bautista-Puig and his colleagues (2021) conducted an analysis of sustainability performance in both public and private universities in Spain, considering social, economic, and environmental perspectives. The study's findings reveal variations among institutions, with some showcasing higher scientific activity in sustainability, while others specialize in the field but with less overall production. However, the study distinctly indicates that despite the societal significance of university sustainability, it has not yet been fully

integrated into the overarching strategies, activities, and policies of the system (Bautista-Puig & Sanz-Casado, 2021)an increasing number of these institutions have recognized their responsibility and are incorporating sustainability into their operations, and practices, following a holistic approach. Despite these efforts in the implementation, there are still many challenges to pursue sustainability. In the Spanish framework, there is a lack of studies that investigate sustainable development in higher education by considering all the dimensions. Especially, the efforts of the Spanish Universities in research have been scarcely analysed in detail. This study analyze how Spanish Public and Private Universities (SUE . Eduardo and his colleagues (2021) carried out a study examining the influence of unmanned vehicles on the infrastructure index. Additionally, they estimated the potential of aerial biomass, carbon, and carbon dioxide stored in the green spaces of the university campus through the analysis of photogrammetric data within a Geographic Information System (GIS) (Fuentes et al., 2022)C and CO2, stored in the green spaces of a university campus using photogrammetric data analyzed in a Geographic Information System (GIS. In 2020, a study was conducted to assess the global ranking of universities and evaluate their performance worldwide using the Green Metric system. The findings indicated that universities in Asia and Europe exhibited superior performance in the realm of sustainability (Muñoz-Suárez et al., 2020). Drawing from the cited references, extensive literature exists on sustainability, particularly within higher education, encompassing assessments, measures, activities, and sustainability rankings. However, it is notable

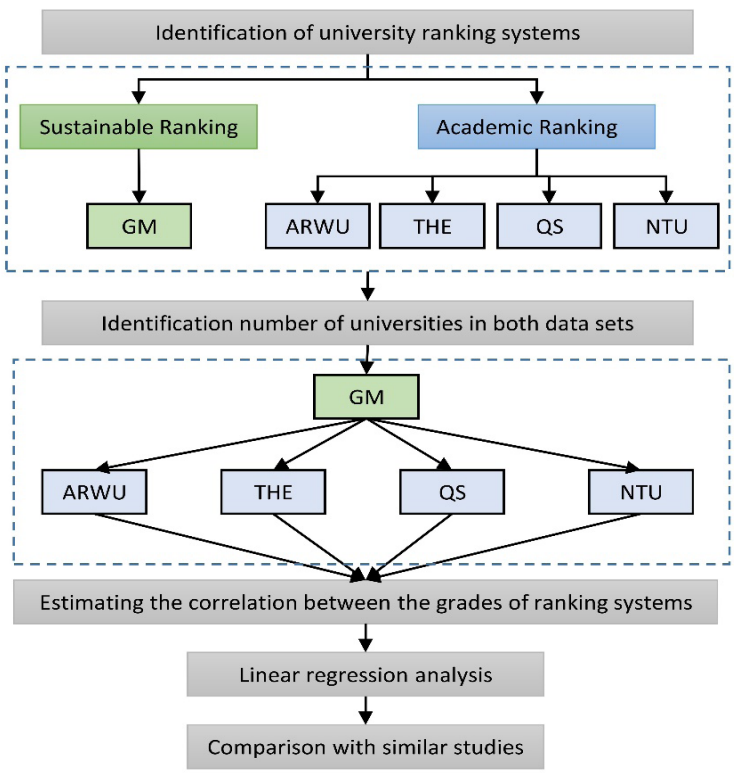


Figure 1: The research framework

that many of these cases are situated in regional, national, or local contexts, or they constitute case studies focused on a single university's initiatives to establish and evaluate sustainability in various countries. There remains a relatively limited number of studies in this field specifically within the context of Iran. Figure 1 illustrates the research framework.

MATERIALS AND METHODS

To investigate the correlation between environmental sustainability and the academic performance of universities, an extensive data collection process was initiated, encompassing five distinct university ranking systems. Specifically, the Green Metric rating system, specifically designed to evaluate universities' activity and performance in the realm of green and sustainability, was chosen for this study. Simultaneously, data from four renowned university rating systems—Academic Ranking of World Universities (ARWU), World University Ranking (QS), World University Ranking by The Times (THE), and National Taiwan University (NTU)—were gathered to measure the academic performance of universities. Linear regression analysis was then applied to estimate the correlation between sustainability performance and academic performance of universities. This research encompasses all the universities in Iran that were ranked in the Green Metric system and scientific performance systems for the year 2021. Table 1 illustrates the number of universities in different ranking systems and the number of factors considered in each system.

Table 1 : Ranking systems and number of universities

Ranking System	Number of Universities (2021)	Number of Factors
GM	42	6
ARWU	11	6
THE	24	5
QS	5	6
NTU	12	8

UI Green Metric World University Ranking (GM)

The Global Green Metric ranking, initiated in 2010 by the University of Indonesia, serves as a tool to gauge and quantify the level of sustainability in higher education institutes and universities. This ranking system assesses sustainability across three dimensions: environment, economy, and society. The environmental scope encompasses the utilization of natural resources, ecological management, and pollution prevention. The economic scope focuses on cost savings and profits, while the social scope centers on education, society, and social contribution. The Green Metric system is structured around six main categories, each assigned a specific weight in the overall assessment: location and infrastructure (15%), energy and climate (21%), waste (18%), water (10%), transportation (18%), and education and research (18%), as outlined in Table 2 (Universitas Indonesia, 2021).

Table 2: UI Green Metric sub-dimensions

Factors	Score	Weights (%)
1 Setting and Infrastructure (SI)	1500	15
2 Energy and Climate Change (EC)	2000	21
3 Waste (WS)	1800	18
4 Water (WR)	1000	10
5 Transportation (TR)	1800	18
6 Education and Research (ED)	1800	18
	10000	100

The Green Metric rating system has gained significant traction in Iran, with Zanjan University leading the way as the first university in the country to participate in this ranking since 2014. Notably, from 2014 to 2021, it consistently secured the top position among Iranian universities. Over the years, there has been a steady increase in the number of Iranian universities participating in this ranking, reaching a total of 42 universities in 2021, as detailed in Table 3. Despite the growing popularity of the Green Metric system in Iran, there is a noticeable gap in research regarding the relationship between the scientific and environmental performance

of universities in the country. To address this gap, the present study focuses on exploring and comparing the relationship and correlation between the scientific and environmental performance of Iranian universities, juxtaposed with the findings of analogous global research.

Academic Ranking of World Universities (ARWU)

Concerning the Academic Ranking of World Universities (ARWU), it is noteworthy that this scholarly ranking system for global universities was initially introduced by the Center for World Class Universities (CWCU) at the Graduate School of Shanghai Jiao Tong University (SJTU) in 2003 (Academic Rankings of World Universities, 2012). Starting from 2009, the ranking activity has been overseen by an independent organization, the Shanghai Ranking Consultancy, now recognized as Shanghai Ranking. This ranking is designed to assess both the educational and research quality of universities. Each year, over 2000 universities and research institutes undergo evaluation across three overarching aspects: the entire institution, specific fields, and subjects (key courses).

Times Higher Education World University Rankings (THE)

The Times ranking system for universities and higher education institutions stands out as one of the most renowned international ranking systems. Its inception dates back to 2004 through a collaboration between Times and QS, and it has been published independently since 2010. With a mission to assist universities in understanding their standing, the institution also aids students in identifying the most suitable universities based on their abilities and interests, facilitating their transformative educational journey. The system addresses the ranking of universities across four levels: global, sub-regional, subject, and regional, aligning with the overarching theme of "Promoting education, research, and innovation in higher education"(Times Higher Education, 2022).

QS World University ranking (QS)

The QS World University Rankings, initially published in 2004 by the consulting firm Quacquarelli Symonds (QS), undergo annual updates. Originally, this ranking was jointly released with the Times ranking between 2004 and 2009. Subsequently, the two entities began publishing independent ratings. Unlike the Times ranking, which adopted a new ranking method, QS continued using its existing methodology, previously shared with The Times. In collaboration with the Elsevier database, QS has successfully established a comprehensive global ranking system for universities and subjects across various fields of study (QS World University Rankings, 2016).

Table 3 : The number of Iranian universities participating in the Green Metric ranking system from 2014 to 2021

Rank	2014	2015	2016	2017	2018	2019	2020	2021
1_99	-	1	1	1	1	1	2	1
100_199	1	-	-	2	1	2	-	4
200_299			1	3	2	1	4	3
300_399			-	2	4	2	7	2
400_499			1	2	4	7	2	6
500_599					2	4	9	7
600_699					1	3	8	4
700_799					1	2	3	4
800_899							5	9
900_999							1	2
The number of Iranian participants	1	1	3	10	16	22	41	42
Total number of participants	361	407	515	619	718	780	911	956

National Taiwan University Ranking (NTU)

The National Taiwan University (NTU) presents its ranking as the Scientific Articles Performance Ranking for universities worldwide. This ranking predominantly centers on the research performance of universities, encompassing three primary categories: research efficiency, research impact, and research merit. Introduced in 2007, the ranking is published annually on the National Taiwan University's website. (Polytechnique, 2013).

Table 4: Ranking systems of universities and the weight of each system's indicators

ranking		Factors	Weights (%)
(GM)	1	Setting and Infrastructure	15
	2	Energy and Climate Change	21
	3	Waste	18
	4	Water	10
	5	Transportation	18
	6	Education and Research	18
(ARWU)	1	Alumni of an institution winning Nobel Prizes and Fields Medals	10
	2	The staff of an institution winning Nobel Prizes and Fields Medals	20
	3	Highly cited researchers in 21 broad subject categories	20
	4	Papers published in Nature and Science	20
	5	Papers indexed in Science Citation Index	20
	6	Per capita academic performance of an institution	10
(THE)	1	Teaching-learning environment	30
	2	Research-volume, income, reputation	30
	3	Citations-research influence	30
	4	Industry income-knowledge transfer	2.5
	5	International outlook-staff, student, research	7.5
(QS)	1	Academic Reputation	40
	2	Employer Reputation	10
	3	Faculty/Student Ratio	20
	4	International Faculty Ratio	20
	5	International Student Ratio	5
	6	Citations per faculty	5
(NTU)	1	Number of articles in the last 11 years	10
	2	Number of articles in the current year	15
	3	Number of citations in the last 11 years	15
	4	Number of citations in the last two years	10
	5	The average number of citations in the last 11 years	10
	6	h-index of the last two years	10
	7	Number of Highly Cited Papers	15
	8	Number of articles in the current year in high-impact journals	15

Case Study

Iran, with the official name of the Islamic Republic of Iran, is a country in West Asia and in the Middle East. With an area of 1,648,195 square kilometers, this country is the second largest country in the Middle East. In Iran, there are 2,569 universities 141 of which are public (Ministry of Science, Research and Technology) and they are registered in 31 provinces of the country. According to their area and activities, universities and campuses have a significant impact on the environment and society. For this goal, Iranian universities that have participated in both the Green Metric ranking and in each of the four university ranking systems have been identified according to the table below.

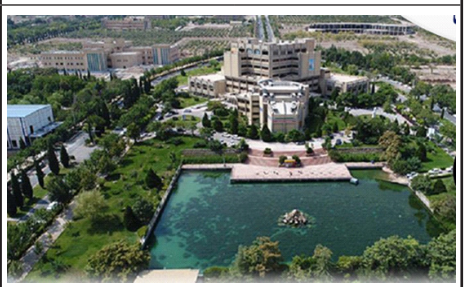
Table 5: Display of participating universities in all five systems

University name	Location	Established year	Area (hectares)
Amirkabir University of Technology	Tehran- Tehran	1337	9
Azarbaijan Shahid Madani University	East Azerbaijan - Tabriz	1367	435
Babol Noshirvani University of Technology	Babol - Mazandaran	1348	17
Ferdowsi University of Mashhad	Mashhad-Khorasan Razavi	1328	250
Isfahan University	Isfahan - Isfahan	1325	300
Kashan University	Kashan- Isfahan	1352	195
Kurdistan University	Sanandaj - Kurdistan	1353	120
K.N.Toosi University of Technology	Tehran- Tehran	1307	3.5
Mohaghegh Ardabili University	Ardabil - Ardabil	1357	11.5
Sharif University of Technology	Tehran- Tehran	1344	20
Shahid Beheshti University	Tehran- Tehran	1338	60
Tarbiat Modares University	Tehran- Tehran	1360	20
Tehran University	Tehran- Tehran	1307	21
Yasouj University	Kohgiloyeh and Boyerahmad-Yasuj	1362	42

a. Tehran University

b. Ferdowsi University of Mashhad

c. Sharif University of Technology



d. Isfahan University

DISCUSSION AND FINDINGS

To comprehend the relationship between the Green Metric system's ranking and the scientific ranking systems of universities, separate regressions were conducted, aligning Green Metric performance with the performance of universities as assessed by the Shanghai, Times, QS, and Taiwan ranking methods. For this analysis, universities in the Green Metric rankings were matched with each of the four participating university ranking systems. Consequently, the sample size for each regression estimate varies based on the specific ranking system under consideration. The table below displays the universities present in both sets in 2021.

Table 6: Number of common universities in each system

Data sets	Number of universities in both data sets
GM & ARWU	6
GM & THE	12
GM & QS	4
GM & NTU	6

Also, the following model has been used to observe the relationship between the grades of the Green Metric system and the academic performance systems of universities:

$$AS_i = \mu + bGM_i + e_i$$

In Equation (1), ASi corresponds to the academic scores of the university in five different university ranking systems, namely Shanghai, Times, Kiwanis, Leiden, and Taiwan in 2021. GMi shows the ranking of each university in the Green Metric system in 2021. β is the green metric score coefficient, α is the constant term, and ε represents the estimation error conditions. For a more detailed examination, a data distribution chart has been created. In this chart, the horizontal axis represents the Green Metric rank variable, while the vertical axis represents the scientific rank of the universities. The correlation coefficient (R2) has been employed as a measure to quantify the strength of the relationship between these variables.

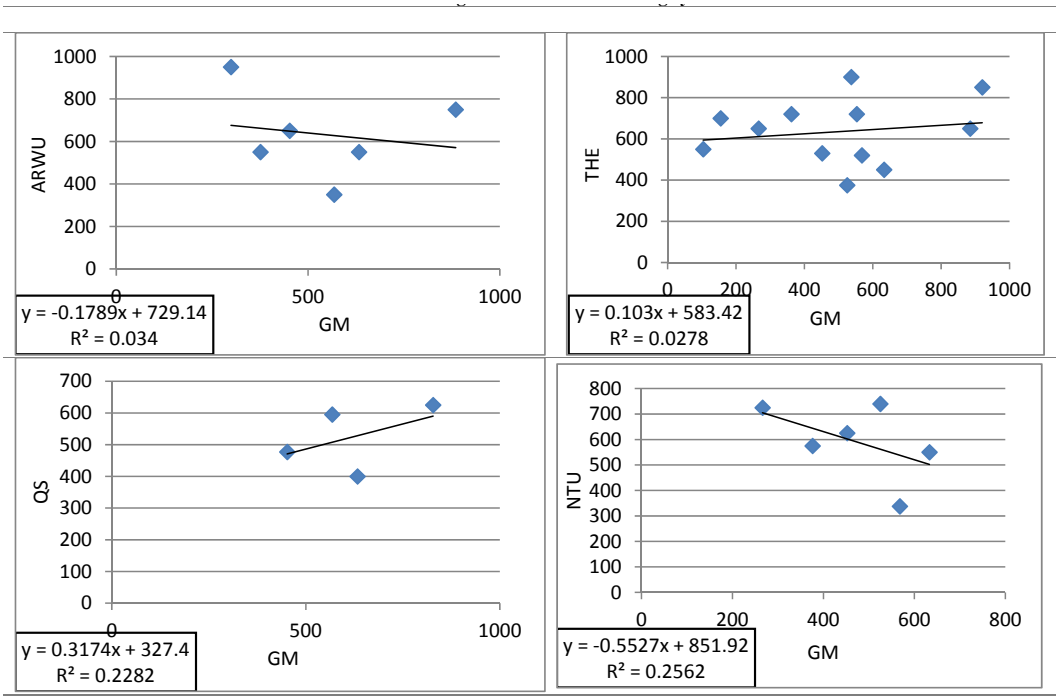


Table 7: Showing the correlation of rating systems

The table above illustrates the correlation results between the Green Metric system's rating and the academic performance ratings provided by four different methods. A positive correlation is denoted by R greater than zero, while a negative correlation is indicated by R smaller than zero. The degree of strong correlation is measured by how close the R value is to 1 (or -1 in the case of a negative correlation). The Green Metric ranking system exhibits a minimal relationship with the Shanghai and Times systems. In other words, the academic performance evaluation systems of Shanghai and Times cannot be correlated with the environmental policies of Iranian universities, and each should be regarded as an independent variable. One potential reason for this lack of dependence may lie in the indicators used in these ranking systems. The research findings identify the Times and Shanghai rating systems as the most central. Additionally, the number of research and references to articles and individuals for each university, recognized as the primary and most influential indicators in these systems, suggest that the focal point and target community for these rankings are the world's top research universities, with considerations such as Nobel Prize recipients, researchers with high citations, or articles published in prestigious journals like Nature and Science. Among the scientific ranking systems, one that exhibits a relatively stronger relationship and correlation with Green Metric s is the QS ranking system by Quacquarelli Symonds (QS). Since 2004, the QS ranking system has been annually presenting the world's universities, utilizing six evaluation indicators for the top 700 universities. Key indicators in this system include university reputation, employer reputation, and student-to-faculty ratio, citations per faculty member, international faculty members, and international students. The evaluation information for this ranking system is gathered through subject area expert surveys, employer surveys, the Scopus citation database, and self-reported questionnaires from universities.

The QS ranking system provides a comprehensive view of university quality, encompassing factors such as the ability to hire graduates, sports facilities, and community participation. It extends beyond purely scientific aspects, offering a broader perspective. For this reason, it establishes a more significant connection and correlation with the Green Metric rating system. Among the scientific rating systems studied, the Taiwan rating system has a stronger correlation with the green metric system. But this correlation is negative. In other words, it can be seen from the above graph that the higher the university ranks in the Green Metric system and environmental performance, the weaker it is in the ranking system and academic performance conditions in Taiwan. In this system, evaluation is done by 8 indicators in the three axes of research productivity, research impact, and research excellence, and this system is solely based on scientific articles. On the one hand, the emphasis on research performance and on the other hand, the relatively strong negative relationship with the green metric system, indicates the fact that the articles published by these universities were not related to the field of environment and sustainability.

Table 8: The relationship between scientific rank and environmental rank of Iranian universities

	ARWU	THE	QS	NTU
Constant	-0.1789	0.103	0.3174	-0.5527
R2	0.034	0.0278	0.2282	0.2562
Number of observations	6	12	4	6

In 2021, Kazim Baris and his colleagues investigated the relationship between the green metric ranking system and academic performance for all universities in the world with the same method. The results of the research of Kazim Baris and his colleagues show that obtaining higher grades in Green Metric evaluation has a reflection on scientific grades in most

university ranking systems, and this is contrary to the results obtained in Iran. One of the main reasons for this difference is the influence of the geographical location of the universities. In their country model, they have also considered the location of universities as an important factor that should be taken into account. It is reasonable to expect that some countries with good financial situation (such as GDP per capita) have a better educational record than others. For example, universities located in the United States are in the top 10 in almost all of the various university rankings(Atici et al., 2021).

Table 9: The relationship between scientific ranking and environmental ranking of world universities(Atici et al., 2021)

	ARWU	THE	QS	NTU
Constant	-3.202	1.257	-2.507	2.124
R2	0.456	0.544	0.511	0.248
Number of observations	86	117	83	85

Another reason for the inconsistency between the obtained results is that the share of old universities in the scientific rankings of universities is higher, while younger universities have higher ranks in the Green Metric ranking system and are more inclined to participate in the above ranking. The validity of this article can be measured by the results of the research by Muñoz-Suárez and his colleagues, which was conducted in 2020. The above research, which was conducted to investigate the effect of the geographical location and the age of the universities on the scientific and environmental ranking, showed that European and North American universities are dominant in the top 500 universities in the global ranking of universities, while Asian universities are more in the Green Metric ranking and then European universities are placed. In fact, among the first 500 scientific rankings of world universities, older universities are scientifically dominant, while younger universities have this status in the Green Metric ranking (Muñoz-Suárez et al., 2020).

RESULT AND CONCLUSION

This study aimed to explore the relationship between scientific rating systems and green metric rating systems, focusing on universities that participated in both Green Metric and four other university ranking systems. The correlation coefficient (R2) was employed to measure the intensity of this relationship. The results revealed a negligible relationship between the Green Metric ranking system and the Shanghai and Times systems. This can be attributed to the concentration of indicators in these two systems on research quantity and citations, which may not align closely with the sustainability criteria assessed by Green Metric. On the contrary, the Kivas ranking system exhibited a relatively higher correlation with Green Metrics, possibly due to the broader range of indicators considered. This suggests that a more comprehensive scientific assessment aligns better with sustainability measures. Interestingly, Taiwan's ranking system demonstrated a stronger, albeit negative, correlation with the Green Metric system. This negative correlation suggests that universities excelling in scientific articles, as emphasized by Taiwan's system, may not necessarily prioritize research related to environmental sustainability. Comparing these findings with previous research, it becomes evident that the influence of location, geographical factors, age, and history significantly impacts both scientific and environmental rankings of universities. These factors should be integral considerations in any comprehensive evaluations of university performance. In summary, this research underscores that scientific performance alone cannot serve as a reliable criterion for evaluating environmental performance in Iranian universities. The intricate interplay of factors such as geographical location and institutional history must be acknowledged to comprehensively assess the sustainability initiatives and environmental impact of these educational institutions.

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