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SUSTAINABILITY DISCLOSURE: ANALYSIS OF THE MOST SUSTAINABLE UNIVERSITIES IN THE UI GREENMETRIC AND THE RANKINGS

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SUSTAINABILITY DISCLOSURE: ANALYSIS OF THE MOST SUSTAINABLE UNIVERSITIES IN THE UI GREENMETRIC AND THE RANKINGS

Abstract

Goal: Analyze the performance of universities around the world regarding sustainability and scientific production based on the UI GreenMetric and THE Ranking. **Design|Methodology|Approach:** The methodology adopted is characterized as descriptive, quantitative and documental, with an analysis of the period of the year 2021. The data collection was based on the universities belonging to the GreenMetric 2021 Ranking. **Results:** Among the main results found, it is noteworthy that universities are making significant advances towards sustainable development. Moreover, certain institutions have sustainable practices and are references in scientific and academic production, especially in the European continent, because they are more representative in terms of the number of institutions. It is important that institutions stimulate competitiveness among themselves, in order to obtain better rankings, which favors institutions to have more visibility and the possibility of investments in teaching and research and impact of publications. **Originality|Value:** The study provides a debate on the discussion of the criteria of both rankings, which can be important for the sustainable development of institutions, providing important theoretical and practical contributions.

Key-words: Universities, Sustainability, UI GreenMetric, THE Ranking.

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1. Introduction

In light of existing discussions about the adoption of sustainability in the university context, instruments have emerged to measure sustainability performance (Jorge et al. 2016). Educational institutions can be considered important instruments in the advancement and dissemination of issues that promote sustainable development and in society as a whole (Ragazzi & Ghidini, 2017). Likewise, by adopting sustainability practices on their campus, in addition to having a good image in front of their stakeholders (Nejati et al., 2013), they play an important role in developing environmentally and socially responsible practices (Mesenguer-Sanchez et al., 2020), which tends to contribute to society's awareness of sustainability (Tiyarattanachai & Hollmann, 2016; Gaitán-Angulo et al., 2022).

Since the 1970s, universities have been active in sustainability practices and stand out in fostering sustainable development in the academic environment and on campus (Wright, 2004; Baker-Shelley, Van Zeijl-Rozema and Martens, 2017; Rohrich & Takahashi, 2019; Moura, Lopes & Yamazaki, 2023). Higher education, with teachers, educators, society and institutions in general, act strategically in implementing sustainable solutions in the education environment (Agbedahin, 2019). Thus, not only do they play a fundamental role in promoting sustainability through internal policies, academic disciplines, research and sustainable practices on campuses, but they also act as drivers of sustainable initiatives in the community, contributing to improving sustainability and achieving the Goals of the Sustainable Development (Dagiliute & Liobikiene, 2015; Dagiliute, Lobikiene and Minelgaite, 2018; Leal, Azeiteiro and Aleixo, 2024).

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In a competitive scenario, society, according to its expectations, expects quality and compliance from organizations (Jiménez et al., 2021), which makes it necessary for them to pay attention to the positive impacts on the environment, arising from their activities, and mitigate the negative ones (Góes & Magrini, 2016). Institutions, through projects, teaching and research, expand the dissemination of issues for the development of debate and involvement in sustainability in society (Góes & Magrini, 2016; Tiyarattanachai & Hollmann, 2016; Fanea-Ivanovici & Baber, 2022).

There are several barriers to the adoption of sustainability, such as lack of structure, lack of engagement with sustainable causes, lack of resources (Brandli et al., 2015; Ávila et al., 2017), lack of knowledge and materials (Leal Filho et al., 2021), as well as scarcity of financial resources and availability of funding (Aleixo et al., 2018). However, there are a number of mechanisms capable of engaging universities in these issues, such as creating partnerships with institutions to raise funds, sustainable internal resource control (Ávila et al., 2017) and the global rankings, for due to measure the performance of these institutions around the world (Muñoz-Súarez et al., 2020), can engage the institution and society in the development of sustainability.

Among these rankings stands out the UI GreenMetric that evaluates the level of sustainability of universities, presenting their weaknesses and strengths (UI GreenMetric, 2021). To this end, this ranking measures the performance of institutions through six variables: indicators such as infrastructure; issues that address energy and climate change; waste; water; transportation; and, education and research (UI GreenMetric, 2021). The Times Higher Education (THE) analyzes the performance of educational institutions in relation to teaching, research, citations, international perspective, and industry income criteria, which are related to academic impact and reputation.

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In view of the above and through the need to identify the performance of universities regarding sustainability based on the UI GreenMetric ranking, and the scientific production from the THE ranking, this study aims to analyze the performance of universities around the world regarding sustainability and scientific production based on the UI GreenMetric and THE Ranking.

Thus, universities for having a significant responsibility in training future professionals through knowledge (Wendlandt Amézaga et al., 2022), prepare them to face the challenges of sustainability (Valdés e Comendador, 2022), which demonstrates the relevant participation for the fulfillment of the Sustainable Development Goals (SDGs) (Casado-Aranda et al., 2020; Thongplew et al., 2021). In addition to these factors, the pursuit of more sustainable practices makes them drivers for strengthening a culture focused on sustainable development (Soini et al., 2018; Purcell et al., 2019). To strengthen this attitude, the UI GreenMetric ranking consolidates the quantification of efforts spent in this area (Ragazzi e Ghidini, 2017), which intensifies and fosters the fulfillment of actions towards sustainability in the university context (Lauder et al., 2015).

Previous studies have already analyzed the UI GreenMetric ranking by evaluating it as a tool to support university management, academic performance, analysis of challenges and opportunities in universities, as well as understanding its purpose, methodology and application in the area of sustainability in universities (Sari e Tjahyono, 2012; Suwartha e Sari, 2013; Sari e Widanarko et al., 2016; Suwartha e Berawi, 2019; Lourrinx e Budihardjo, 2019; Atici et al., 2021; Friman et al., 2022). However, studying the analysis of sustainability performance and scientific production in the most sustainable universities in the world, based on the UI GreenMetric ranking,

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is considered incipient in the literature, which provides the opportunity for the development of the present study and better understanding of this approach.

In relation to theoretical contributions, this research allows filling the gap in the literature with evidence regarding the understanding of how universities are measuring performance against sustainability indicators and scientific production based on the UI GreenMetric and THE Ranking. As for practical contributions, it allows universities to identify how the performance of major institutions around the world is regarding the aspects of sustainability and academic production, so that it provides an opportunity for re-evaluation by identifying points for improvement as to practices in the areas covered by the study.

The results found also aim to foster debate in society about the importance of sustainability practices developed by educational institutions and contribute by showing that sustainability can be considered a competitive advantage for universities worldwide. This research also contributes by encouraging Higher Education Institutions (HEI) and governments to support initiatives aimed at sustainability and the improvement of education.

In this sense, this chapter addresses, in the next topics, subjects such as sustainability in universities and the GreenMetric with sustainability performance indicators in these institutions. Next, the method used is presented, followed by data analysis. Finally, the conclusions and opportunities for future research are highlighted based on the considerations made by the authors of the research.

2. Sustainability in Universities

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Universities are institutions that promote research, knowledge transfer in several countries and seek to promote actions for students to develop skills needed for the market (Puertas e Marti, 2019). In addition, they play a significant role in the face of various environmental challenges around the world, aiming to promote positive environmental effects and social change with education, research, and community involvement (Ralph e Stubbs, 2014). However, it is considered necessary for universities to promote sustainability both internally and as an agent of change in the community in which it is embedded (Dagiliute et al., 2018).

Education for sustainable development promotes various challenges in universities (Wright et al., 2022), which makes faculty and staff able to encourage students to face the adversities of society and commit to sustainability (Sammalisto et al., 2015; Huang e Cheng, 2022). When considering the engagement of faculty, staff, students, and the community in disseminating knowledge and promoting sustainable conduct in society (Purcell et al., 2019), the development of sustainable practices is a constant pursuit undertaken by universities (Soini et al., 2018).

Universities are considered to be drivers for building a sustainability-oriented culture (Alshuwaikhat et al., 2016; Purcell et al., 2019), as well as promoting actions that are aligned with and foster the SDGs (Thongplew et al., 2021). On the other hand, the lack of management support from institutions is considered one of the main factors preventing the implementation of sustainable practices (Ávila et al., 2017) and sustainable development policies may not be considered a pre-disposition for them to actually engage with the theme (Leal Filho et al., 2018). However, the potential for transformation towards sustainability occurs when these companies prioritize environmental, social and governance issues, for example, by making institutional

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partnerships and investing in a learning and evolution process (Baker-Shelley et al., 2017), consequently improving performance management (Adams, 2013).

By investing in the transformation to sustainability, universities prioritize issues such as the well-being of students and employees, in addition to helping preserve the right of future generations to meet their needs with the correct use of knowledge (Baker-Shelley et al., 2017). Likewise, by promoting innovations in sustainable development practices, they improve environmental and economic performance, which collaborates in solving institutional problems and combating unsustainable practices (Ávila et al., 2017). And consequently, in the face of social, environmental, and economic demands, by investing in sustainability practices, they promote lasting effects that can be maintained over time (Valdés e Comendador, 2022).

Universities have several sustainability assessment tools and, according to Lozano (2006), by performing assessments as to their performance, they present higher levels of transparency, consistency and usefulness in decision making, being easily measured and comparable. The evaluation can occur through programs of responsible organizations that instigate a continuous improvement, provide support, carry out the publication of results and issue certifications, which fosters an exchange network between educational institutions and engagement with information related to sustainable development (Góes e Magrini, 2016). Thus, the emergence of university rankings, considered as university rankings, have the objective of evaluating the academic reputation, research of universities and their performance, giving attention to issues such as sustainability protection (Puertas e Marti, 2019), issues that will be addressed in the next section.

3. Performance Indicators of Scientific Production and Sustainability

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The sustainability performance assessment tools are a way to bring together data and information that demonstrate the position and situation of various educational institutions, contributing to an improvement in the implementation of policies and boost the advancement of sustainability in these universities (Góes & Magrini, 2016). Galleli et al. (2021) when evaluating the structure of the global university sustainability ranking, considered that it may not be possible to have a single and most satisfactory ranking, however it may be more suitable according to the reality of the institutions.

The emergence of several rankings allows universities to promote debates regarding the quality and performance of higher education systems, which generates an impact on society and the internationalization of institutions (Sanz-Casado, 2015). In this sense, each ranking system analyzes educational institutions based on measurement criteria and metrics that are identified, according to the development purpose that the rankings are intended to achieve (Valmorbida et al., 2015). Among the existing rankings, some stand out by considering issues such as academic reputation (QS World University Rankings - QS), research volume (Times Higher Education World University Rankings - THE Ranking), ranking of researchers (Academic Ranking of World Universities - ARWU), and sustainability (UI GreenMetrics).

This study highlights the Times Higher Education World University Rankings - THE Ranking, which publishes a list of the best universities in the world that have an emphasis on the research mission and scientific and academic excellence. The UI GreenMetric, in turn, emerged with the intention of promoting a green profile in universities, so that it would be possible to compare the performance of institutions and promote sustainable actions in the dimensions of research, education and environmental issues (Suwartha & Sari, 2013). Thus, the institutions are green, earn good scores in the rankings and the institutions by betting on environmental

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sustainability, become more competitive, in front of other universities around the world (Atici et al., 2021). Moreover, it was developed with the intention of instigating and encouraging universities to contribute through actions towards sustainability (Lauder et al., 2015; Altun & Zencirkiran, 2022).

The sustainability assessment tools have a significant role in having sustainability in educational institutions, because it strengthens guidelines for future actions and provides a direction for continuous improvement (Góes & Magrini, 2016). Institutions that comply with the sustainability practices listed in the ranking, demonstrate to satisfy their stakeholders regarding this question, which promotes a positive perception regarding the quality of life on campus (Tiyarattanachai e Hollmann, 2016). As for GreenMetric's university sustainability scores with academic ranking indicators, they corroborate the importance of adopting environmental sustainability policies adopted by university administrations (Atici et al., 2021).

The prevailing criteria are energy and climate change, which suggests that universities pay greater attention to environmental issues so that they implement policies to mitigate climate impacts (Suwartha & Sari, 2013). Others point out that indicators such as transportation and education policy are significant criteria for promoting a greener university (Ounsaneha et al., 2018). Thus, a university despite being an excellent institution in terms of the education it provides, may have an unsatisfactory ranking in the global rankings, which reinforces that these institutions, to achieve good performance, need to be committed and develop actions that protect the environment (Muñoz-Suárez et al., 2020) and assess strengths and weaknesses towards sustainable development (Suwartha & Sari, 2013).

4. Methodology

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The methodology adopted is characterized as descriptive, quantitative and documental, with an analysis of the period of the year 2021. The data collection was based on the universities belonging to the GreenMetric 2021 Ranking. The 100 most sustainable universities in the ranking were used as the study population. The sample was selected from the search and data collection of the 100 universities in THE's ranking. Thus, it was found that of the 100 universities in the UI GreenMetric, 78 participate in the THE ranking and provide scores of the performance in the academic area.

The data of the variables collected in the study are based on the criteria of each ranking, as presented in Table 1.

Table 1 – Criteria for performance evaluation of universities according to THE Ranking and UI GreenMetric

Nº	THE Ranking	Nº	UI GreenMetric
1	Teaching (TEA)	6	Environment and Infrastructure (EI)
2	Research (RES)	7	Energy (ENE)
3	Citations (CIT)	8	Waste (WAS)
4	International Perspective (IP)	9	Transportation (TR)
5	Industry Income (IR)	10	Education and Research (ED)

Source: Prepared by the authors (2023).

In THE Ranking, indicators are used, being grouped by teaching (learning environment) which corresponds to 30% of the grade, research (volume, performance and reputation) with 30%, citations (influence of research) in 30%, international perspective (employees, students and research) with 7.5% and industry income (knowledge transfer) with 2.5%, according to the THE Ranking (2022). After analyzing the evaluation criteria, the 13 performance metrics that represent the five pillars are

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weighted according to THE's relative importance assessment. Upon arriving at the final population of universities and indicators, the score for each university is generated by weighting the metrics and the final rankings are calculated.

In GreenMetric, to understand the scores, it is necessary to highlight that the categories have a weighting of points. Each category has several statements for evaluating universities and the score for each item will be numerical to process the data statistically, with the scores being simple counts of the responses. In turn, each criterion will have its respective category in a general class of information and the results, when processed, the raw scores will be weighted to obtain a final calculation (GreenMetric, 2023). According to Green Metric, the score represents 15% configuration and structure, 21% energy and climate change, 18% waste, 10% water, 18% transport and 18% education and teaching.

A comparative table was created of the general position of the 100 best universities positioned in the GreenMetric ranking, in order to analyze individually and together whether they corresponded to the performance obtained in THE Ranking. In the following analyses, we seek to compare the performance of the main universities in the ranking in relation to different indicators, such as teaching, research, citations, industry revenue and international perspective, related to THE Ranking and in relation to configuration and structure, energy, waste, water, transport and energy, related to GreenMetric, in order to understand how the most sustainable universities in the world and participants in the rankings stood out in academic performance.

In general, for data analysis, we sought to develop a descriptive and comparative examination of the two rankings and their respective areas of activity, so that it was possible to understand how the most sustainable universities in the world

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are positioned in academic performance. Thus, the study used as a basis the criteria analyzed in both the UI GreenMetric (2021) and THE Ranking (2021) methodology.

5. Results and Discussion

5.1 Descriptive analysis of the THE and UI GreenMetric rankings

For the first stage of data analysis, a ranking was developed with the universities belonging to the UI GreenMetric and their respective positioning in the THE ranking, both with data and information from the year 2021. Table 2 shows the list of universities in the study sample.

Table 2 – List of universities belonging to the GreenMetric ranking and position in THE Ranking

Position GreenMetric	Position THE	University	Continente
1	62	Wageningen University and Research	EU
2	158	University of Nottingham	EU
3	80	University of Groningen	EU
4	601-800	Nottingham Trent University	EU
5	67	University of California, Davis	AN
7	70	Leiden University	EU
8	301-350	University College Cork	EU
9	401-500	University of Connecticut	AN
10	201-250	University of São Paulo USP	ALC
11	251-300	University of Southern Denmark	EU
12	167	University of Bologna	EU
13	501-600	Dublin City University	EU
15	401-500	Bangor University	EU
16	401-500	University of Bremen	EU
18	1001+	Autonomous University of Nuevo León	AN
20	501-600	Turin Polytechnic	EU
21	501-600	Universidade de Limerick	EU
23	401-500	University of Limerick	EU
24	801–1000	Universitas Indonesia	AS

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25	118	Freie Universitat Berlin	EU
26	201-250	King Abdulaziz University	AS
27	601-800	Research (RES)	AS
28	801-1000	Citations (CIT)	EU
30	1001+	International Perspective (IP)	AS
31	1001+	Universidade Nacional de Chi Nan	AS
32	301-350	National Chi Nan University	AS
33	1001+	Universitas Gadjah Mada	AS
34	401-500	University of Eastern Finland	EU
36	77	University of Warwick	EU
37	501-600	Università degli Studi dell'Aquila	EU
38	501-600	Universidad Complutense De Madrid	EU
39	501-600	University of Carleton	AN
40	1001+	Institut Teknologi Sepuluh Nopember	AS
41	1001+	University of Rosario	ALC
42	601-800	University of Pécs	EU
44	198	Autonomous University of Barcelona	EU
45	1001+	Kasetsart University	AS
46	1001+	IPB University	AS
47	801-1000	University of Alcalá	EU
48	1001+	Federal University of Lavras - UFLA	ALC
49	1001+	University of A Coruña	EU
50	1001+	Technical University of Riga	EU
51	501-600	Lincoln University	AO
52	601-800	Al-Balqa Applied University	AS
53	1001+	University of Santander	ALC
54	401-500	Università degli Studi di Genova	EU
55	1001+	National University of Colombia	ALC
56	1001+	Yunlin National University of Science and Technology	AS
58	501-600	Keele University	EU
59	601-800	Mahidol University	AS
60	1001+	Benemérito Universidad Autónoma de Puebla	AN
62	1001+	Czech University of Life Sciences Prague	EU
63	1001+	Chaoyang University of Technology	AS
65	401-500	University of Campinas	ALC
68	1001+	National Chin-Yi University of Technology	AS
69	1001+	Shinshu University	AS
70	1001+	University of Antioch	ALC
72	33	University of California San Diego	AN
73	1001+	Siberian Federal University	AS
75	1001+	Suranaree University of Technology	AS
76	1001+	Foundation University of the North Barranquilla	ALC

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78	201-250	Tilburg University	EU
80	351-400	Politecnico di Milano	EU
82	801-1000	Universidad de los Andes Colombia	ALC
83	801-1000	King Mongkut Thonburi University of Technology	AS
84	501-600	Tunku Abdul Rahman University	AS
85	801-1000	University of Szeged	EU
86	1001+	Bolivarian Pontifical University	ALC
87	801-1000	National Autonomous University of Mexico	ALC
88	801-1000	University of Minho	EU
89	50	University of Washington St. Louis	AN
91	601-800	University of Ozyegin	ALC
92	1001+	Rey Juan Carlos University	EU
93	501-600	National University of Cheng Kung	AS
97	251-300	Università degli Studi di Padova	EU
98	1001+	Autonomous University of Yucatán	AN
99	1001+	Erciyes University	ALC
100	401-500	Università degli Studi di Salerno	EU

Source: Prepared by the autors. (2023)

As shown in Table 2, it can be seen that the universities that reach the top 100 positions in the UI GreenMetric ranking, also appear as the top 100 belonging to THE's ranking, such as Wageningen University and Research (Netherlands), University of Groningen (Netherlands), University of California - Davis (United States), Leiden University (Netherlands), University of California San Diego (United States), University of Warwick (United Kingdom) and Washington University St. Louis (United States). It is noteworthy that the above institutions are international references in sustainability, due to their emphasis on improvements in campus infrastructure, investments in curricula, green areas, courses focused on sustainability and academic research related to the area.

Besides the universities mentioned that are in evidence among the top 100 of the rankings, other institutions stand out as the University of Nottingham (UK), University of Bologna (Italy), Freie Universitat Berlin (Germany) and the Autonomous University of

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Barcelona (Spain), which also demonstrate to be engaged with better environmental performance and academic area. On the other hand, it can be seen that several educational institutions not necessarily by investing in sustainable practices on campus, may have better academic performances, which is the case of Nottingham Trent University (UK), University of Connecticut (U.S.) Universidad Autónoma De Nuevo León (Mexico), Diponegoro Universities (Indonesia), Universitas Gadjah Mada (Indonesia), Institut Teknologi Sepuluh Nopember (Indonesia), Kasetsart University (Thailand), IPB University (Indonesia), among others, which present significant differences in positions between the two rankings.

Thus, according to the literature, the existence of university rankings does not necessarily seek to generate competition among universities, but is ideal for institutions to promote continuous improvements in university management and direct leadership towards community development (Rozman & Marhl, 2008; Góes & Magrini, 2016). In this sense, in order to achieve success in actions towards sustainable development, it is necessary that institutions have mechanisms to evaluate the performance of criteria in institutions (Parvez & Agrawal, 2019), which collaborates in the importance of adopting environmental sustainability policies by the management of universities (Atici et al., 2021).

To understand the perspective of the top 10 UI GreenMetric institutions on different variables of THE, Table 3 presents the scores under teaching, research, citations, industry income, and international perspective.

Table 3 – List of Universities in the GreenMetric ranking with information from THE ranking.

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Pos. GM	Pos. THE	University	GP THE	TE	RES	CIT	II	IP
1	62	Wageningen University and Research	69,4	48,2	56,4	97,3	100	83,7
2	158	Nottingham University	56,9	42	42,4	80	38,7	87,8
3	80	University of Groningen	65,1	41,2	56,2	92,6	69,8	85,1
4	601-800	Nottingham Trent University	30.2–36.3	18.9	12.7	59.9	33.9	74.3
5	67	University of California, Davis	68.9	60.5	66.2	81.9	50.4	66.9
7	70	Leiden University	66.7	45.6	66.0	84.1	72.6	82.2
8	301-350	University College Cork	45.6–47.9	23.7	23.5	82.9	44.8	82.5
9	401-500	University of Connecticut	39.8–43.5	34.7	28.8	59.0	36.7	53.0
10	201-250	University of São Paulo USP	50.6–54.2	56.6	58.9	44.2	41.7	35.2
11	251-300	University of Southern Denmark	48.0–50.5	21.1	30.2	85.2	71.1	78.4

Legend: Pos. Position; GP. General Position; TE. Teaching (30%); RES. Research (30%); CIT. Citations (30%); II. Industry Income (7.5%); IP. International Perspective (2.5%).

Source: Prepared by the authors (2023).

The best performing universities are in Europe (Wageningen University and Research, University of Nottingham, University of Groningen, Nottingham Trent University, Leiden University, University College Cork and University of Southern Denmark), North America (University of California, Davis and University of Connecticut) and Latin America (University of São Paulo USP).

When analyzing the variables, in terms of teaching, the institutions that stand out in the learning environment are the University of California, Davis, the University of São

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Paulo and Wageningen University and Research. Regarding research, the University of California, Davis and the University of São Paulo stand out, together with Leiden University. Thus, among the most sustainable universities in the world, it can be considered that these are institutions with reference in teaching and research worldwide. In terms of citations, Wageningen University and Research, Groningen University and Leiden University are considered the most sustainable institutions and those that show the greatest influence through the dissemination of new knowledge and ideas in the scientific environment.

In relation to the Industry Income, Wageningen University and Research, Leiden University and the University of Southern Denmark have a reference regarding investments in innovation and knowledge transfer. Finally, the International Perspective, considers Wageningen University and Research, Nottingham University and Groningen University as institutions that show influence in a global scenario due to the number of students, collaborators and researchers from different countries. In addition to the possibility of having international authors, an aspect that enhances the relevance of the studies developed.On the other hand, in order to analyze how the top 10 institutions of the UI GreenMetric are in different perspectives in the context of sustainability, Table 4 presents the scores regarding configuration and structure, energy and climate change, waste, water, transport and teaching and research.

Pos. GM	Pos. THE	University	GP GM	CS	ENE	WAS	WAT	TR	ER
1	62	Wageningen University and Research	9300	1325	1825	1800	1000	1550	1800

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2	158	Nottingham University	8850	1375	1525	1800	1000	1500	1650
3	80	University of Groningen	8800	1275	1550	1800	1000	1650	1525
4	601-800	Nottingham Trent University	8750	1200	1750	1800	800	1450	1750
5	67	University of California, Davis	8750	1300	1650	1725	950	1450	1675
7	70	Leiden University	8700	900	1825	1800	1000	1650	1525
8	301-350	University College Cork	8700	1300	1650	1650	850	1550	1700
9	401-500	University of Connecticut	8700	1250	1500	1725	1000	1475	1750
10	201-250	University of São Paulo USP	8700	1350	1475	1650	950	1675	1600
11	251-300	University of Southern Denmark	8675	975	1825	1725	1000	1550	1600

Table 4 – List of Universities belonging to the GreenMetric ranking with information from GreenMetric.
Legend: Pos. Position; GP. General Position; CS. Configuration and Structure (15%); ENE. Energy and Climate Change (21%); WAS. Waste (18%); WAT. Water (10%); TR. Transportation (18%); ER. Education and Research (18%).
Source: Prepared by the authors (2023).

As shown in Table 4, when considering the analysis of the universities with the UI GreenMetric ranking, one can see similar scores among them per variable. The institutions that are a reference in the ranking, through the best scores obtained, are Wageningen University and Research (9300), which stands out in the Energy and Climate Change (1825) and Teaching and Research (1800) scores, the University of Nottingham (8850) in Configuration and Structure (1375) and Waste (1800) and the

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University of Groningen (8800), with good scores in Transportation (1650) and Waste (1800).

From a perspective of the analyzed categories, as for the variable of Configuration and Structure, the University of Nottingham and the University of São Paulo USP gain prominence, which suggests that these educational institutions have Green Campuses, which are concerned with promoting areas of environmental preservation and developing sustainable energy. On the other hand, institutions such as Wageningen University and Research, Leiden University and University of Southern Denmark achieve reference in the area of Energy and Climate Change which, according to the GreenMetric (2021) methodology, is the criterion with the highest relevance in the evaluation. Thus, they are educational institutions that seek to invest in energy efficient appliances, renewable energy and greenhouse gas emission reduction policies, and the implementation of green buildings.

In the scope of Waste, Wageningen University and Research, the University of Nottingham, the University of Groningen, Nottingham Trent University and Leiden University are the most sustainable institutions with the best GreenMetric ranking that become a reference in the treatment and recycling of waste, sewage disposal and the use of plastic paper on campus. Regarding the water variable, there are also several universities that present investments in water management, which enables greater conservation and protection of the habitat, with institutions such as Wageningen University and Research, the University of Nottingham, the University of Groningen, Leiden University, the University of Connecticut and the University of Southern Denmark being highlighted on this topic.

As for the Transport variable, the University of São Paulo USP, Leiden University and the University of Groningen are the institutions that show the greatest

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attention to issues such as carbon emission and the level of pollutants at the university, as well as the adoption of policies that value the reduction of the use of motorized vehicles and that encourage a pedestrian policy, the use of bicycles and public transportation. Finally, regarding Teaching and Research, Wageningen University and Research, Nottingham Trent University and the University of Connecticut are institutions that develop courses, lectures, research and disciplines that deal with sustainability, in such a way as to identify new solutions and thus foster sustainable development in society, through new professionals in the market, professors, researchers and academics.

Next, Figure 1 presents the research variables of THE ranking and how the most sustainable institutions are doing according to each criterion.

Figure 1 – Top ranked universities by THE Ranking variable

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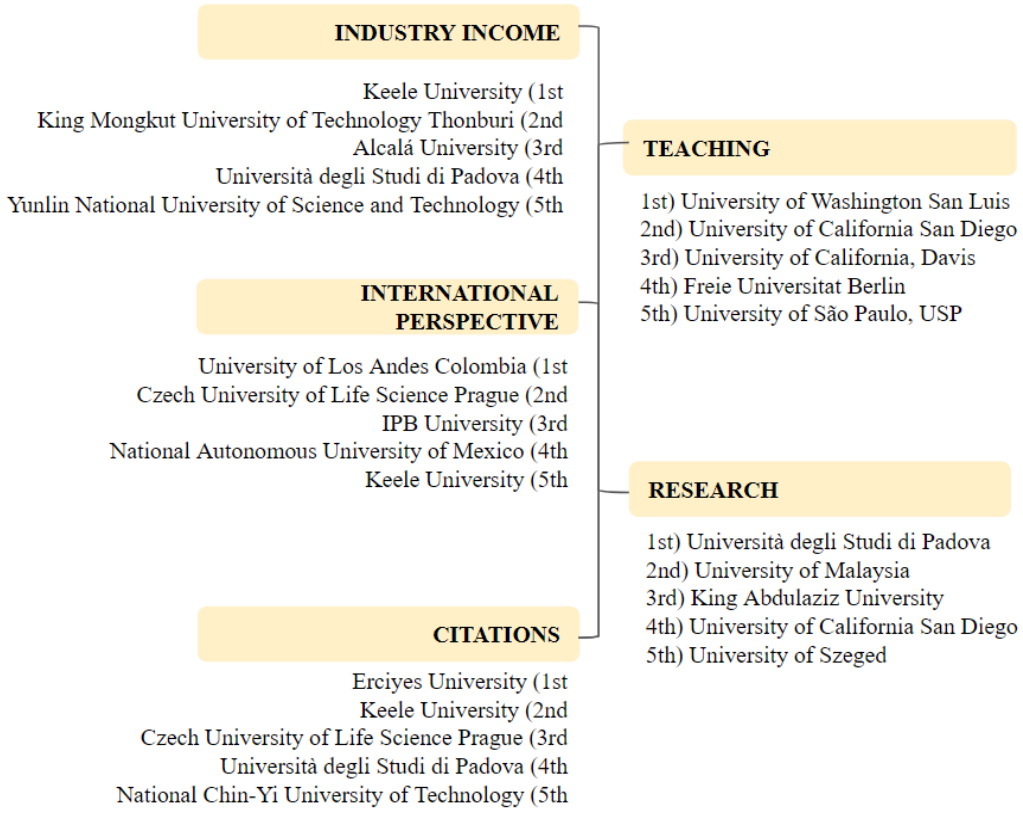

Source: Prepared by the authors (2023).

Given the THE ranking research variables studied, universities such as University of California, San Diego are benchmarks in the teaching and research rankings. The Czech University of Life Sciences Prague comprises one of the best positions in both the citation rankings and the international perspective. The institutions that predominate in the top positions in THE's rankings are Keele University and Università degli Studi di Padova, when considering what have good scores on the variables of citations, the international perspective and industry income.

When considering an analysis of the universities with the best academic performance positions and which are likewise institutions responsible for sustainable development, those belonging to the countries of the United States, Italy, China and the

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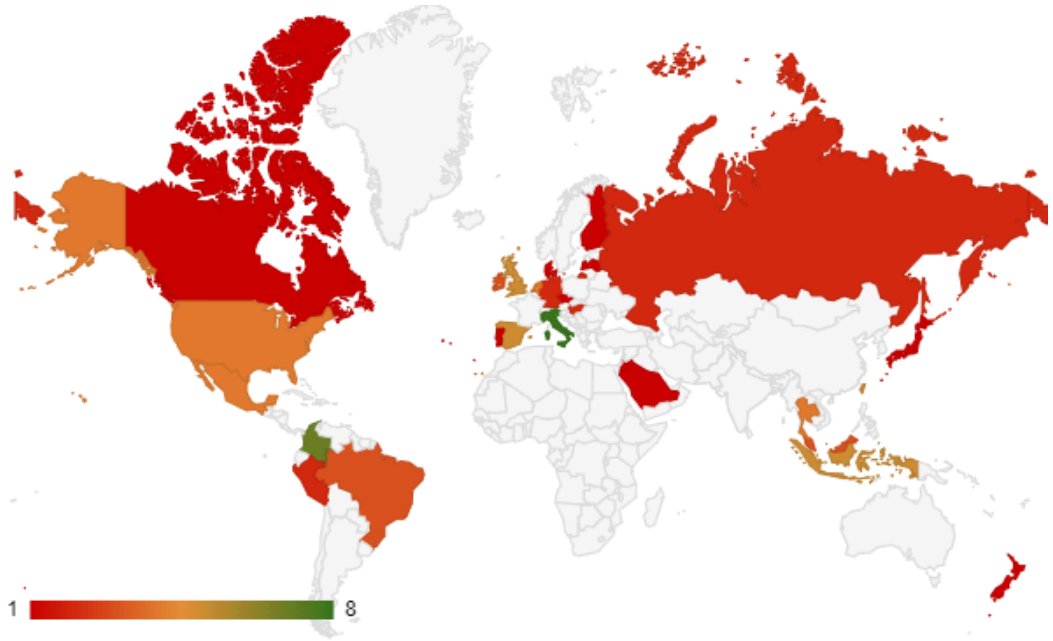
United Kingdom stand out. More broadly, when considering all 78 universities in the sample, Figure 2 shows the number of institutions by country.

Figure 2 – Universities by countries



Legend: Color Red: between 01 and 02 universities; Color Orange: between 03 and 06 universities; Color Green: between 07 and 08 universities.
Source: Prepared by the authors (2023).

Among the countries of the universities participating in the sample, Italy stands out again, with the largest number of universities that appear in the rankings analyzed, these being 8. In sequence, Colombia (7), Spain, Indonesia, United Kingdom and China (5), which suggests that these countries are highlighted with more sustainable universities and that have better academic indexes focused on teaching, research and academic impact in relation to other countries in the sample. On the other hand, countries such as Saudi Arabia, Canada, Denmark, Finland, Japan, Jordan, Latvia,

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New Zealand, Portugal, and the Czech Republic have fewer universities in the sample ranking.

Faced with a worldwide ranking, it is possible to state that the participating universities belong to five continents. As presented in Figure 3, the majority of the most sustainable universities participating in THE ranking belong to the European continent (35), followed by Asia (21), Latin America (12), North America (9) and Oceania (1), with only one participating university. European universities are predominant before the sample, which is consistent with findings in the literature (Leal Filho et al., 2019), with a significant number of institutions compared to the other continents of the world.

Given the above, according to the analysis of the data obtained, it can be inferred that there are universities that seek to make investments to be more sustainable and that concomitantly, seek to be a reference in the academic field. On the other hand, it is noteworthy that the universities that participate in the UI GreenMetric ranking and have the top positions in it, do not necessarily achieve higher scores in THE Ranking. Thus, it is verified the important role that universities are playing in addressing social, environmental and economic issues, because by making investments in sustainability practices on campus, they can achieve permanent effects that can be maintained over time (Valdés & Comendador, 2022).

It is observed over the years that there is an increase in interest in green universities by students (Dagiliute et al., 2018). Consequently, they make it possible to become agents of transformation by contributing to society's awareness of sustainability (Tiyarattanachai & Hollmann, 2016; Gaitán-Angulo et al., 2022) and strengthening the role of educational institutions in the face of sustainability practices on campus, as they positively impact on environmental and social development (Nejati et al., 2013;

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Mesenguer-Sanchez et al., 2020) and with the potential to make significant changes towards sustainable development.

On the other hand, it also becomes necessary for educational institutions to be competitive in search of better positions in academic rankings such as THE Ranking. This will allow institutions to have greater visibility and the possibility of increased investments in the area of teaching and research, greater impact in the publications made and to make more partnerships and collaborations at market level and with international researchers (Bozeman et al., 2013; Pucciarelli e Kaplan, 2016). This perspective becomes relevant to be analyzed, when considering that it strengthens the academic community, as well as allows greater access and attraction of investments, so that thus, areas as important as sustainability, may have consolidated practices on university campuses

6. Conclusions

The present study aimed to analyze the performance of the universities with the best positioning in the UI GreenMetric and THE Ranking. Given the data obtained and analyzed in the research, the universities in the sample that belong to the GreenMetric ranking and that have the best academic performance indices are predominantly found in countries such as Italy, the United States, China and the United Kingdom. The European continent can be considered a reference, for having in its territory, the universities that most apply practices in favor of sustainable development by demanding attention to a greener campus, energy sources and climate change, water and waste treatment, emission of pollutants and teaching and research focused on sustainability..

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Among the HEIs, there are several with significant prominence and which can be models to inspire others, especially those seeking to become more sustainable. The Universities of Wageningen, University of California, University of San Diego, and the University of Washington San Luis deserve emphasis for their scientific and academic performance. These are among the one hundred most sustainable universities in the world, with excellent academic performance. In view of the evidence, it can be seen that the educational institutions make significant efforts to be a reference in the academic field and to act towards sustainability.

With the analysis of the UI GreenMetric and THE Rankings, it could be observed that many universities make investments in sustainability practices on campus, however, such practices do not necessarily guarantee them in the best positions in the scientific area, citation impact, partnerships with companies, a greater international influence, etc. Thus, Muñoz-Suárez et al. (2020), suggest that institutions obtain a good performance and continue to strive through commitment to actions both in the academic, scientific, teaching and research, and in the area of sustainability.

The development of this research generates contributions by highlighting the position of universities that make significant investments in the area of sustainability and how they are facing academic and scientific performance, internationalization, promotion of market practices and research influence. In addition to these indicators, it allows us to verify which universities belong to which countries and continents. For, besides presenting unique results, they demonstrate their actions, projects and innovative practices, which make the institution internationalized and as a model for others who wish to follow in this process. In practice, universities can promote levels of engagement, competitiveness and innovation among them, making sustainability a link between science, market and globalization.

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In view of the cutout analyzed in the present research, there were some limitations, not being possible to cover more topics in the analysis arising the opportunity for future studies. Thus, it is suggested to conduct a qualitative analysis through the application of a questionnaire with open questions and analyze the sustainability reports of the universities in the sample, in order to bring evidence and understand what leads universities to obtain their respective positions both in the UI GreenMetric ranking, as in THE ranking. Another possibility of future study is to correlate the variables that were used in the survey and criteria of both rankings, in order to understand which ones have greater correlation with each other and understand the similarities existing in the adoption of sustainability practices and academic impact.

Finally, it is also recommended that quantitative research instruments be applied to make the study sample more comprehensive, in addition to being able to understand what efforts educational institutions are making to achieve high positions in the rankings, as well as to understand what they are developing not only to achieve good rankings in favor of sustainability and education, but also how this has contributed to the Sustainable Development Goals and the 2030 Agenda.

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