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Highlights

- Study assessed usage & impact of sustainability rankings on universities' sustainability agendas
- Rankings motivate universities for sustainable development efforts
- Rankings empower stakeholders, reward sustainability, drive change, and inspire enhanced efforts in organisations
- Rankings prioritise sustainability, encourage collaboration and drive institutional change for a sustainable future

University rankings and sustainable development: the state of the art

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Abstract

Purpose: In light of the growing emphasis on sustainability in higher education, this study explores the effectiveness of sustainability university rankings, specifically focusing on sustainable development (SD), to understand their impact on advancing universities' sustainability goals and address gaps in practical implications and limitations.

Design/methodology/approach: This study examines sustainability rankings in higher education (HE) through document analysis. Chosen for significance, these rankings were evaluated for regional participation, criteria, and the top 20 universities. The method involved scrutinising official ranking websites for diverse perspectives on sustainability. The results are classified into three categories: regional participation, assessment criteria, and top universities in the latest iterations.

Findings: The findings show that sustainability rankings are widely spread, and their existence has led to an increased motivation for universities to further engage in efforts in the field of SD. This study offers suggestions for optimising the role of promoting SD principles and practices in HE.

Originality/value: This comprehensive assessment sheds light on rankings' operations and success levels. It makes a significant contribution to the literature, providing an unprecedented overview of analysed rankings -and one sustainability assessment and their impact. This analysis will be valuable for universities towards the integration of SD principles and practices into the HE environment.

Keywords: Sustainability; Rankings; Universities; Higher Education; Sustainable Development

1. Introduction

University rankings allow universities to promote debates regarding the quality and performance of higher education (HE) systems, which have implications for society and institutions' internationalisation (Leal Filho et al., 2023; Sanz-Casado, 2015). Each ranking analyses educational institutions based on different measurement criteria and metrics according to their purpose (Valmorbida et al., 2015). Most of the ratings combine indicators into a single score using the weight-and-sum method. Indicators are mutually supportive and compensate for each other, e.g., the large number of academic publications by academic staff can compensate for weaknesses in teaching (Soh, 2015). The modern ranking of higher education institutions (HEIs) can be traced back to the early twentieth century when 'standardisation' in education became a norm (Geiger, 2014), at a time when ranking systems usually compared universities within a single country. The popularity of global university rankings has increased significantly in the last two decades since the first Academic Ranking of World Universities, also known as the Shanghai Ranking, was published in 2003. Currently, there are several dozen global and hundreds of national university rankings (see **Box 1** for major rankings). Global rankings have brought about a profound shift in HE, challenging the notion of territorial boundaries within academia (Hazelkorn, 2018).

Major **global** rankings

- The Academic Ranking of World Universities (Shanghai Ranking)
- The Times Higher Education World University Rankings
- QS World University Rankings
- SCImago Institutions Rankings

Major **national** rankings

- U.S. News & World Report Best Colleges Ranking (US)
- Carnegie Classification of Institutions of Higher Education (US)
- The Times Good University Guide (UK)

Box 1. Major global and national university rankings

Since universities are often publicly funded, the rankings help to satisfy the public demand for accountability and transparency (Hazelkorn, 2008). Although ranking systems give the impression that they are objective and scientific, in reality, the choice of indicators and weightings reflects their designers' priorities or value judgments (Hazelkorn & Mihut, 2021; Marginson, 2014). Although most rankings rely on the same sources, the university score and, consequently, the ranking order are heavily influenced by ranking designs prioritising different aspects of university performance and using different normalisation schemes. As a result, rankings are usually stable over time but often significantly different from each other (Selten et al., 2020).

The most common indicators used in university rankings are quality of teaching and research, innovation, industrial and societal impact, internationalisation, and reputation. At the same time, such indicators as the quality and impact of teaching and student success are more difficult to measure and standardise, and therefore, they rarely lend themselves to university rankings. Many ranking systems acknowledge that most of their indicators are size-dependent, giving large universities a clear advantage. Although some attempt to normalise university output per academic and administrative staff, data on the number of university employees are rarely freely available for all universities and, therefore, seldom used for standardisation. Most of the current rankings heavily weight research productivity and disproportionately favour research-intensive institutions. As a result, by relying on the rankings, a prospective student

may choose a research-oriented university over a teaching-focused one that would offer a more practical education at a lower price (Altbach, 2021). The reliance on convenience, readily available measures such as the number of publications, citations, or prestigious prize winners among academic staff and graduates is another limitation of popular ratings (Soh, 2015). Although some rankings include indicators such as reputation and faculty/student ratios, they do not measure the quality of teaching or its impact on employment prospects (Altbach, 2021). Since the rankings aim to provide a single score for each university, they also usually do not quantify intra-institutional diversity (Ioannidis et al., 2007).

University sustainability rankings can serve as reflective indicators of the organisational structure within a given institution. University rankings benefit different types of stakeholders, such as prospective students, recruiters of college graduates, funding agencies and donors, research collaborators, and academic job seekers. The positioning and performance of a university in sustainability rankings often correlate with its commitment to integrating sustainability across various facets of its organisational framework. The rankings typically consider factors such as institutional policies, governance structures, administrative practices, and engagement with sustainable development (SD) initiatives.

So, universities' rankings are also beneficial for assessing the performance of universities by their top management and governing boards, which might help with strategic planning and development. Thus, institutions with well-established sustainability offices, clear reporting structures, and active involvement of stakeholders tend to fare well in sustainability assessments. Moreover, these rankings may highlight how effectively sustainability practices are embedded within academic and administrative units, showcasing the depth of organisational alignment toward sustainable principles. This nuanced assessment provides valuable insights into the holistic integration of sustainability within a university.

At the same time, university rankings have clear limitations. The primary complaint is related to measurement validity. Indeed, because of diverse perspectives on the marginal value of universities among stakeholders utilising university rankings, there is no consensus on what constitutes academic quality and how to measure it. Despite the limitations and criticisms associated with university rankings, they still hold considerable value and continue to be widely used for a variety of reasons, such as attracting quality faculty and research funding, institutional benchmarking, helping in decision-making for prospective students, international collaboration and student mobility, support policymaking, and enhancing reputation.

In the context of sustainability within HE, this study seeks to investigate the utilisation and effectiveness of sustainability university rankings in guiding universities towards the advancement of their sustainability agendas. Despite the growing significance of sustainability in academic institutions, there remains a notable research gap regarding the practical impact and reach of sustainability rankings. Therefore, this research aims to fill this gap by analysing the applications and limitations of such rankings, shedding light on their conceptual frameworks and advantages. The primary objective is to discern the role of sustainability university rankings in fostering universities' commitment to SD. To achieve this objective, an in-depth document analysis was conducted on the official websites of the selected university rankings. This research approach involves a systematic examination of existing documents to extract valuable information and obtain insights meticulously. As a result, this study aspires to offer valuable insights that can inform universities, policymakers, and stakeholders about the potential of sustainability rankings as instruments for catalysing positive changes in HEIs' sustainability practices.

2. University rankings on sustainable development

University rankings provide a systematic approach to assessing the sustainability efforts of HEIs (Bautista-Puig et al., 2022), offering a standardised framework that enables comparisons between universities, encourages competition, and incentivises universities to improve their

sustainability practices. The advantages of university rankings include enhanced institutional reputation, increased transparency, and the ability to attract environmentally conscious students, faculty, and funding. Furthermore, in the SD field, sustainability university rankings are becoming increasingly important, given the growing societal concern about environmental issues and the role of education in addressing them. This kind of ranking also helps promote sustainable practices within universities and community engagement on sustainability issues. In order to investigate this topic, prominent worldwide university rankings are described below and briefly presented in **Table 1**.

Table 1. Summary of the four analysed sustainability university ranking

Ranking	Region	2022 Scope
People & Planet Ranking (P&P)	United Kingdom	153 institutions
Times Higher Education Impact Ranking	Global	1,406 institutions
UI GreenMetric World University Rankings	Global	1,050 institutions
QS World University Rankings	Global	1,422 institutions

University sustainability rankings allow an assessment of the extent to which universities incorporate SD principles and practices into their core functions, including teaching, research, operations, and community services (Aina et al., 2019). These rankings offer valuable insights into universities' sustainability efforts and play a crucial role in identifying sustainability leaders within the HE sector (Galleli et al., 2022). Fischer et al. (2015) noticed that expanding the number of rankings enlarged the diversity of methods used to assess SD at HEIs. The development of these systems has helped define and consolidate the most critical dimensions to be addressed in order to optimise the implementation of SD initiatives in HEIs around the world (Alghamdi et al., 2017; Findler et al., 2018). By employing a benchmarking approach, ranking systems also facilitate the development of strategies for implementing SD initiatives aligned with best practices (Alba-Hidalgo et al., 2018).

University ranking systems have facilitated the acceleration of energy efficiency improvements and the broader adoption of renewable energy sources, significantly reducing energy consumption and carbon emissions (Dağlioğlu et al., 2020). Researchers have also associated the implementation of sustainability ranking and assessment systems in HEIs with the implementation of waste reduction and recycling initiatives (Utama et al., 2018), the strengthening of stakeholder engagement and partnerships (Caeiro et al., 2020; Leal Filho et al., 2022), and the attainment of green infrastructure and building certifications (Mehmood et al., 2019), to name a few fruitful achievements attributed to the emerging ranking systems regarding SD.

To enhance the value and depth of our study on university rankings and sustainable development, we advocate adopting a whole-institutional approach toward sustainability, as proposed by Kohl et al. (2022). Kohl et al. argue that a fragmented approach, where sustainability initiatives are isolated within specific departments or areas, may limit the overall impact and effectiveness of a university's sustainability efforts. The whole-institutional approach calls for an integrated strategy that permeates the entire university structure, aligning

its mission, values, and practices with the principles of sustainable development. This approach recognises the interconnectedness of sustainability across various domains and encourages universities to weave sustainability into the fabric of their institutional identity.

Sustainability rankings help to support the whole institution's approach to sustainability at universities by providing a comprehensive framework for assessing and enhancing sustainability efforts across all aspects of the institution. This includes:

i) *Curriculum and Research*: Promoting and integrating sustainability into educational programs and research agendas.

ii) *Campus Operations*: Implementing sustainable practices in energy use, waste management, transportation, and building maintenance.

iii) *Community Engagement*: Fostering partnerships and outreach programs that support sustainability in the local and global community.

iv) *Governance and Strategy*: Developing policies and strategic plans that prioritise sustainability.

Finally, rankings provide a benchmark for universities to measure their performance against peers. This can drive accountability and motivate institutions to improve their sustainability practices.

2.1 People & Planet Ranking (P&P)

The P&P is a comprehensive and independent assessment of universities' environmental and ethical performance in the United Kingdom (UK). Established in 2007 by the largest student network in the UK, it consists of one example of a bottom-up approach to drive positive change by assessing universities' sustainability efforts (Jones, 2012). Additionally, it considers ethical investment policies, social responsibility initiatives, and integration of sustainability into the curriculum. In 2023, it assessed 153 universities across various criteria, including carbon management, ethical investment, staff and student engagement, and education for SD. The ranking's focus on UK universities limits its global reach and may not fully capture the sustainability performance of institutions outside the UK. The assessment process relies on self-reporting, which could be subject to biases or inaccuracies (People & Planet University League, n.d.).

2.2 Times Higher Education Impact Ranking

Launched in 2019, the Times Higher Education Impact Ranking highlights universities' efforts in addressing pressing global challenges. It assesses universities across several key areas, including research, teaching, campus operations, and community engagement. The Times Higher Education Impact Ranking assesses universities' contributions towards the United Nations (UN) Sustainable Development Goals (SDGs) (Times Higher Education, 2023). This ranking system assesses universities' research, outreach, and stewardship activities concerning the SDGs. The ranking is proliferating quickly, nowadays counting more than 1400 universities worldwide. By focusing on the SDGs, this ranking system encourages universities to align their missions and strategies with the global sustainability agenda. The ranking's focus is on research outputs that may overshadow other important aspects of sustainability, such as campus operations and community engagement. The reliance on bibliometric data may disproportionately favour institutions with high research output. The Impact Ranking recognises universities' research outputs and efforts to integrate sustainable practices into their operations and engage with local and global communities (De la Poza et al., 2021). It promotes interdisciplinary collaboration, as universities must address various SDGs across disciplines (Derakhshan et al., 2021).

2.3 UI GreenMetric World University Rankings

Established by the UI in 2010, the UI GreenMetric Ranking provides a platform for universities worldwide to showcase their sustainability efforts. The ranking assesses universities' performance in energy usage, waste management, transportation methods, water consumption, and environmental education. In 2022, it assessed 1050 universities worldwide to showcase their sustainability efforts. It emphasises transparency and assesses universities across various environmental indicators (UI GreenMetric World University Ranking, n.d.). Universities must submit data and evidence on their sustainability initiatives, which experts then assess. The UI GreenMetric Ranking considers quantitative metrics, such as greenhouse gas emissions and energy consumption, and qualitative aspects, such as sustainability policies and initiatives. The ranking's reliance on self-reported data challenges ensuring accuracy and comparability among participating universities. The methodology may not fully capture the complexities and nuances of SD efforts (Lauder et al., 2015). Furthermore, this ranking also uses education and research indicators to capture the characteristics of HEIs, such as the ratio of courses centred on sustainability, the ratio of research expenditure, and annual publications related to sustainability (Horan & O'Regan, 2021).

2.4 QS World University Rankings

The QS World University Rankings is widely recognised as a comprehensive and influential ranking system. The Sustainability indicator in the QS rankings considers factors such as sustainability policies, governance, energy efficiency, waste management, and research output on SD. It recognises universities that have made significant progress in integrating sustainability principles into their core activities. By including sustainability as a critical component, the QS rankings motivate universities to prioritise sustainability as an integral part of their strategies and operations. The sustainability indicator's inclusion as a subset within a broader ranking may limit its visibility and impact. The reliance on self-reported data and multiple indicators may introduce biases and challenges in comparability (QS Top Universities, 2022).

In **Figure 1**, the main contributions of these four rankings are condensed, as well as challenges to consider. This scheme illustrates how the selected university rankings can be considered useful tools to advance sustainability efforts worldwide.

Overall, while these four rankings highlight universities' sustainability efforts and foster a culture of sustainability in the context of HE, there are certain limitations to consider, including regional biases, variations in data quality, and a focus on specific aspects of sustainability. Therefore, it is essential to critically assess and contextualise the rankings' results to understand universities' sustainability performance comprehensively. By continually refining their assessment criteria and aligning with global sustainability frameworks, these rankings can further strengthen their impact in driving sustainable practices in HEIs worldwide.

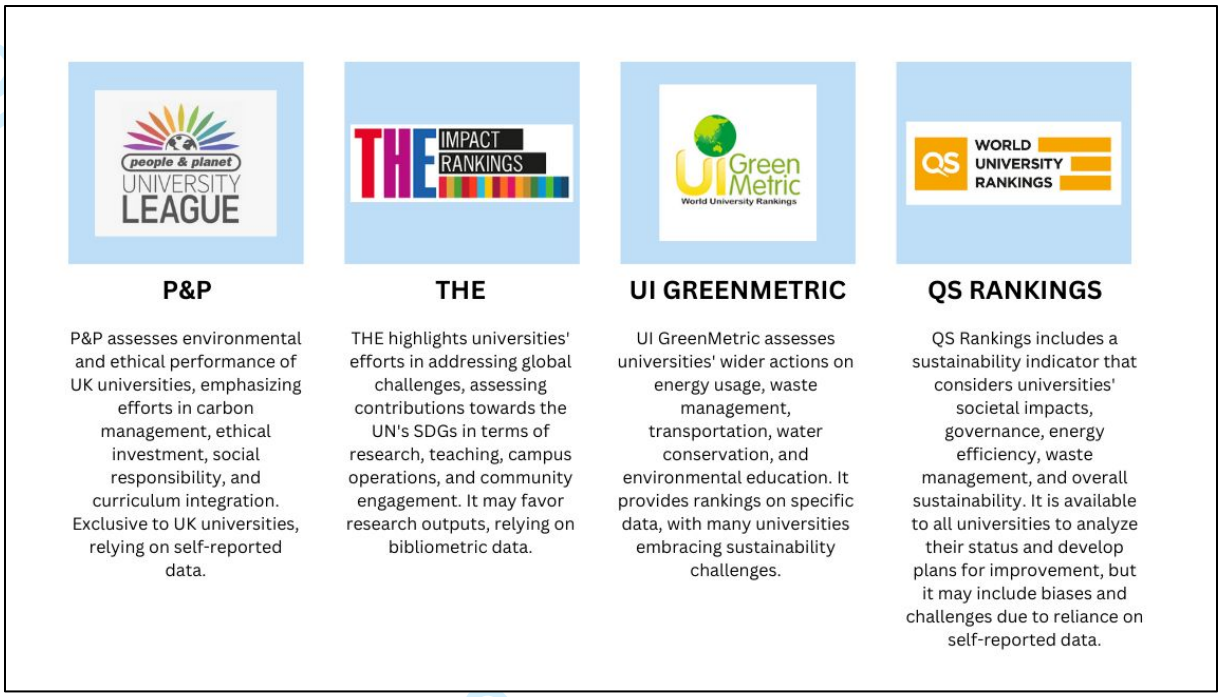

Figure 1. Contributions and challenges of the four selected sustainability university rankings

The question as to how well the rankings integrate the university system (holistically) and how the leading universities incorporate a strategy to be at the top of the rankings can be answered if one considers the fact that universities highly rated on a given ranking, are those whose approaches and practices are in line with the metrics used by that ranking.

3. Materials and Methods

Ranking and assessing sustainability systems in HEIs have diversified and evolved. This study aims to investigate relevant rankings on SD used at universities. This assessment is essential for universities in their path towards SD as it delivers fresh perspectives and establishes a foundation for subsequent academic explorations on this crucial topic. While all these rankings aim to assess the sustainability of universities, as described in the results, their methodologies vary in terms of focus, indicators, and overall approach. Some focus more specifically on environmental sustainability, while others consider social and economic aspects. Each ranking offers a unique perspective and can be used as a tool to assess different dimensions of sustainability at universities.

Analysis of specific trends was carried out by using the information provided on the official websites of the university rankings selected for analysis. This choice is based on the fact that the respective websites provide a set of information and cater to the scrutiny of existing documents. These can be used to gain additional insights, assisting in fostering a profound understanding of the subject matter for the researcher (Bowen, 2009)

These four university rankings were selected for three main reasons. The first is the fact they are the most widely used ones, with a large critical mass of ranked institutions. Secondly, they use well-founded metrics to explain the basis of the rankings. Moreover, they are present in the peer-reviewed literature, with information available in English. The results obtained from the analysis were then classified into three categories: i. Overview of sustainability university rankings, providing the universities per region participating in the ranking systems; ii. Assessment parameters of sustainability university rankings, introducing the criteria used by the selected rankings; and iii. Overview of the latest iterations of the sustainability university rankings through a list of the top 20 universities in the 2022/2023 iteration of the rankings. The

third topic of analysis (iii) focused on the geographical areas where the rankings studied were created and the geographical areas of each of the top 20 universities in each ranking. This was done to gain insights into the interconnections between the two variables (i.e., ranking and universities) whilst maintaining a constant (i.e., country) as suggested by Bryman & Cramer (2004). For iii., data collection was undertaken by searching the websites of each of the rankings. Each of the top twenty universities was included in a table. This was followed by searching the country where the university is based in the Google search engine and inputting the results on the same table as the top 20 universities. To reduce the table's size and to categorise and identify key patterns in the data, countries were represented by superscript letters, the same universities were in different rankings by superscript numbers, and universities were in more than one ranking by using bold letters. This was supported by the creation of a map with the geographical locations of the top 20 universities in the rankings. The patterns, interpretations and connections to the academic literature were presented in the results section.

4. Results

4.1 Overview of sustainability university rankings

Table 2 provides an assessment of the universities participating in four major global ranking university systems across different global regions in the 2022/23 cycle. According to the University of Indonesia (UI) GreenMetric 2022, Europe emerges as the frontrunner, with 274 participating universities, accounting for 26.1% of the total. Asia closely follows it with 591 universities, representing a substantial 56.3% of the total. Latin America and the Caribbean, North America, Africa, and Oceania display comparatively lower participation rates. In the Times Higher Education Impact Rankings 2022, Asia and Europe exhibit a strong presence, with 736 (55.5%) and 268 (20.2%) participating universities, respectively. North America follows suit with 84 universities (6.3%), while Latin America and the Caribbean boast 120 participating institutions (9.0%). Africa and Oceania, although fewer in number, also contribute to the rankings. Moving on to the QS World University Rankings 2022/23, Europe remains prominently represented, with 292 participating universities, making up 41.7% of the total. North America and Asia exhibit a considerable number of universities, with 161 (23.0%) and 159 (22.7%), respectively. Latin America and the Caribbean, Africa, and Oceania feature a comparatively lower number of participating universities. As for the People and Planet University League 2022/2023, exclusively for European universities, all 153 participating institutions are from Europe, with no representation from other regions.

The results indicate regional variations in participation across these four major ranking systems. Europe consistently demonstrates a substantial number of participating universities across most of the rankings, while Asia also shows a robust presence. However, it is worrying that universities from Latin America and the Caribbean, Africa, and Oceania generally exhibit lower levels of participation in these rankings. It is important to acknowledge that these numbers solely reflect the specific ranking systems studied and may not fully represent the overall sustainability efforts of universities globally. These findings imply that university sustainability rankings offer valuable insights into the extent to which universities prioritise and integrate sustainability principles and practices. While there are variations in regional participation, these rankings serve as a platform for universities to benchmark their sustainability efforts, foster healthy competition, and inspire continuous improvement in sustainability performance across the HE sector (Lauder et al., 2015; Muñoz-Suárez et al., 2020).

These four ranking systems examined vary in their strengths and limitations when it comes to assessing campus sustainability, as illustrated in **Figure 1**. Additionally, each system's category and requirements of assessment parameters reflect their specific focus. However, all

four systems share a common goal of adopting a whole-institution approach to sustainability (Kohl et al., 2022). They address various dimensions such as education, research, operations, infrastructure, waste, emissions, outreach, governance, and sustainability assessment and reporting.

Table 2. Number of universities per region participating in the four analysed university ranking systems.

Region	UI GreenMetric 2022	Times Higher Education Impact Rankings 2022	QS World University Sustainability Rankings, 2022/23	People and Planet University League 2022/2023
Europe	274 (26.1%)	268 (20.2%)	292 (41.7%)	153 (100%)
North America	29 (2.8%)	84 (6.3%)	161 (23.0%)	-
Latin America and the Caribbean	124 (11.8%)	120 (9.1%)	31 (4.4%)	-
Asia	591 (56.3%)	736 (55.5%)	159 (22.7%)	-
Africa	29 (2.8%)	82 (6.2%)	16 (2.3%)	-
Oceania	2 (0.2%)	35 (2.6%)	41 (5.9%)	-
TOTAL	**1049**	**1325**	**700**	**153**

4.2 Assessment parameters of sustainability university rankings

Assessment parameters of sustainability university rankings encompass a comprehensive assessment framework designed to enhance the commitment and performance of HEIs towards SD. By considering these assessment parameters, sustainability university rankings aim to provide a holistic view of an institution's efforts in promoting and implementing sustainable practices across various domains. The criteria used by the selected four university rankings analysed in this study are described ahead.

In the case of People & Planet (P&P), information about the participants' universities is taken from the data available on their institutional websites, as well as the data published by the Higher Education Statistics Agency (HESA) Estates Management Record (EMR). To avoid any human errors and provide a quality ranking, P&P provides an appeal period during which each university can examine the provisional score (People & Planet, n.d.). Among the main criteria, more emphasis is given to Carbon Reduction, Environmental Auditing & Management Systems, and Education for Sustainable Development (ESD). The parameters of the P&P ranking are listed in **Table 3**.

Table 3. People & Planet assessment parameters, adapted from People & Planet (n.d.)

Category	Score (%)	Criteria/Parameter
Environmental Policy and Strategy	4	To obtain the highest score in this category, universities must establish Specific, Measurable, Agreed upon or Actionable, Realistic or Relevant, Time-bound (SMART) targets for progress in all eight crucial aspects of environmental management in their policies, action plans, or strategies.
Environmental Auditing & Management Systems	10	This score is based on the progress universities make towards achieving the topmost accreditation level in their external environmental management systems, taking into account whether the standard has been

Category	Score (%)	Criteria/Parameter
		met across the majority of their estate, not just one campus or department.
Managing Carbon	7	Assessment is based on the established approach to carbon management at every level of their emissions in their reduction targets, such as the publicly available carbon management plan and the sustainable travel policy for staff travel.
Sustainable Food	4	The score is based on the assessment of a publicly available sustainable food policy, on the standards related to the procurement contracts (individual suppliers, consortia and other catering purchasing organizations) and on the framework for continual improvement in sustainable food.
Ethical Investment and Banking	7	Assessment is based on the establishment of active and robust Investment and Ethical Banking Policies and on the investment in practices and procedures related to improving the transparency and accountability of the institution.
Ethical Careers and Recruitment	3	All universities will be assessed on their Careers and Recruitment criteria, irrespective of whether they have an in-house careers service. The job titles, contact information, and primary duties of the careers service personnel must be easily accessible and unambiguous.
Staff and Human Resources	6	The scoring system takes into account that institutions differ in size, financial resources, and approach to human resource management. Therefore, they recognise that sustainability responsibility can be shouldered by a diverse range of staff and that some universities may find that adopting a comprehensive approach to sustainability is more culturally suitable for them.
Workers' Rights	7	Assessment of the level of commitment and action a university demonstrates in upholding the workers' rights of the following groups: university staff, farmers and crop producers in the university's global supply chains, and workers involved in manufacturing goods for the university. Universities must regularly ensure that outsourced contracts include the provision of fair pay, working conditions, and pension benefits.
Staff & Student Engagement	5	This parameter involves events promotions, student-led sustainability projects, strategy policies for staff and student engagement, etc.
Education for Sustainable Development (ESD)	9	Assessment is based on the commitment to ESD at the governance level, as well as considering the framework or strategy for ESD, development of skills and projects.
Energy Sources	7	Considers the percentage of renewable energy generated on or offsite compared to the consumption of grid electricity and the total percentage of renewable energy purchased through green tariffs.
Waste and Recycling	8	Considers measures related to the waste mass per head.
Carbon Reduction	15	Consider the carbon emissions per head, including the aspects: university growth/change over time, research activity, size and number of buildings, accommodation, and construction activity.
Water Reduction	8	Consider the water consumption per head, as well as the grey/rainwater consumed.

For the GreenMetric ranking, the criteria encompass several factors, such as the university's size and zoning profile (urban, suburban, or rural), the extent of green space available, electricity consumption related to carbon footprint, transportation, water usage, waste management, infrastructure, energy and climate change, and education and research efforts. Additionally, it considers how the university addresses sustainability issues through its policies, actions, and communication strategies (UI GreenMetric World University Ranking, n.d.). The main criteria are Energy and Climate Change, Waste, Transportation, and Education and Research. **Table 4** presents the criteria used by GreenMetric.

Table 4. GreenMetric assessment parameters, adapted from UI GreenMetric World University Ranking (n.d.)

Category	Score (%)	Criteria/Parameter
Settings and Infrastructure	15	This parameter seeks to assess the extent and density of construction on campus, as well as the use of sustainable building practices, considering, for example, the total campus area, the number of buildings on campus and the area of certified green buildings.
Energy and Climate Change	21	The assessment is based on the energy efficiency and the reduction of greenhouse gas emissions by universities, as well as the engagement in climate change mitigation initiatives. Some indicators are: total annual electricity consumption; total annual fossil fuel consumption; total annual greenhouse gas emissions; and, climate change mitigation programs or initiatives.
Waste	18	Assesses the university's performance regarding the management of waste generated on its campus, including the amount of waste produced, the efficiency of recycling materials, and the implementation of waste management programs.
Water	10	Aims to assess the university's compliance with water resources management on its campus, including the amount of water consumed, the efficiency of water recycling and reuse, and the implementation of water management programs.
Transportation	18	Assesses the university's performance in promoting sustainable transportation and reducing motorized vehicle use on its campus, including the existence of sustainable transportation programs and infrastructure for non-motorized modes of transportation.
Education and Research	18	The assessment is based on the university's performance in promoting teaching, research, and extension activities related to sustainability, including the existence of education and awareness programs for students and staff and scientific research on sustainability-related topics.

Regarding the Times Higher Education Impact Rankings, the parameters focus on four areas: research, stewardship, outreach, and teaching. To determine a university's final rank in the comprehensive table, its score in SDG 17 is combined with its top three scores among the remaining 16 SDGs. SDG 17 contributes 22% to the overall score, while the other SDGs each carry a weight of 26%. Consequently, universities are assessed based on different SDGs, depending on their specific areas of emphasis (Times Higher Education, 2022). The score for each SDG is standardised to account for variations in the scoring range across different SDGs and maintain fairness among universities. This scaling process sets the highest score for each SDG at 100 and the lowest at 0 (Times Higher Education, 2022). This ensures that universities

are assessed equally, regardless of the specific SDGs for which they have provided data. The scaled scores are used to identify the SDGs a university has excelled in, even if those may differ from those in which the university holds the highest or unscaled scores. The institutions provide and endorse their institutional data for utilisation in the rankings. If, in the unlikely event, a specific data point is not available, a value of zero is assigned (Times Higher Education, 2022). Each SDG has three metrics categories: research metrics, continuous metrics, and evidence. The research metrics are based on data provided by Elsevier, considering bibliometric measures, such as specific queries and time frame aligns. The continuous metrics are standardised based on the size of the institution. The evidence concerns the policies and initiatives, considering their availability and public accessibility (Times Higher Education, 2022).

For the QS World University Rankings, the criteria encompass eight categories or indicators, split into two sections: environmental sustainability and social impact. The ecological sustainability measures focus on sustainable institutions, education, and research, while the social impact measures include equality, knowledge exchange, educational implications, employability and opportunities, and quality of life. More specifically, the environmental sustainability measure considers three essential elements: sustainable institutions, sustainable education, and sustainable research. The sustainable institutions' indicator assesses a university's membership in recognised climate action or sustainability groups, availability of a sustainability strategy and energy emissions report, student societies focused on environmental sustainability, and commitment to becoming NetZero (QS Top Universities, 2022). The sustainable education indicator considers alumni outcomes, academic reputation in the earth, marine, and environmental sciences, and availability of courses that incorporate climate science and/or sustainability. The sustainable research indicator assesses a university's research activity surrounding the UN SDGs and government funding for research and development in this area (QS Top Universities, 2022). The website QS Top Universities (2022) also acknowledges that the social impact is considered in this ranking. For that, the equality indicator measures the proportion of female students and faculty, availability of public equality, diversity and inclusion policy, and disability support. The knowledge exchange indicator measures a university's commitment to knowledge transfer and collaboration with less-economically-supported institutions. The impact of education indicators assesses a university's research into quality education, relevant social subjects, and academic freedom. The employability and opportunities indicator considers a university's employer reputation and employment outcomes, research into work and economic growth, and the country's unemployment rate. The final social impact indicator, quality of life, looks at a university's commitment to well-being on and off campus, research activity in this area, and factors such as air quality in the region.

4.3 Overview of the latest iterations of the sustainability university rankings

A list of the top 20 universities in the three international rankings and the one national ranking studied is presented in **Table 5**. The international ranking UI GreenMetric includes three universities in the top 20 rankings in their respective countries, the US and the UK. These findings could support the suggestion that one of the critical considerations in the development of the UI GreenMetric was to allow for context-specific information in response to critiques about other rankings, such as the QS, which penalises universities with a lack of online presence, research outputs, and prestige (Lauder et al., 2015). Therefore, the UI GreenMetric could fulfil its aim of providing a contextualised ranking amongst international rankings. There are 10 universities that are in two rankings. Half of these are in both the Times Higher and QS Rankings. These outcomes suggest these two rankings share similarities but are different from the UI GreenMetric, which does not include any university that is also in the other two international rankings. Academic studies suggest that international sustainability rankings have

structural differences and aspects that need improving (Galleli et al., 2022). In fact, the similarities between Times Higher and QS suggest that developing a more standardised international ranking is possible.

Across all the four rankings addressed by this study, 80 universities appear only in one ranking. This suggests a substantial need for more consistency between rankings. Galleli et al. (2022) advocated that creating a ranking that can be used worldwide may not be possible. A better approach might be for rankings to be developed using context-specific aspects, such as national rankings, like the P&P. Davey (2017) takes the debate even further, arguing that focusing on collecting data for standardised frameworks can be detrimental to implementing SD in HE practices. This is because universities may deprioritise critical thinking aspects of the process. However, sustainability is a competitive advantage for universities (Atici et al., 2021), and many stakeholders use university rankings (Johnes, 2018). For instance, students choose universities, university leaders make strategic decisions, and employees choose workplaces based on rankings (Johnes, 2018). Therefore, rankings serve different stakeholders and can support SD integration at universities. Additionally, rankings can be used to understand power relations and dominant aspects in the HE sector (Pusser & Marginson, 2013). Therefore, university rankings will continue to be developed and used across the industry, and further research is needed on the use and development of rankings.

Table 5. Top 20 universities in the latest iterations of the four analysed university rankings

	UI GreenMetric 2022 [i]	Times Higher Education Impact Rankings 2022[i]	QS World University Rankings: Sustainability 2022/23[i]	People and Planet University League 2022/2023[ii]
1	Wageningen University & Research[n]	Western Sydney University[a]	**University of California, Berkeley (UCB)[iii5]**	Cardiff Metropolitan University[ii]
2	**Nottingham Trent University[ii1]**	**Arizona State University (Tempe)[iii2]**	University of Toronto[c]	University of Bedfordshire[ii]
3	University of Nottingham[ii]	**Western University[c9]**	**University of British Columbia[c6]**	Manchester Metropolitan University[ii]
4	University of Groningen[n]	King Abdulaziz University[sa]	The University of Edinburgh[ii]	University of Reading[ii]
5	University of California, Davis[iii]	Universiti Sains Malaysia[ma]	The University of New South Wales (UNSW Sydney)[a]	University of The Arts London[ii]
6	Trier University of Applied Sciences[g]	**University of Auckland[nz7]**	The University of Sydney[a]	University of Exeter[ii]
7	University College Cork[ir]	Queen's University[c]	The University of Tokyo[j]	University College London[ii]
8	**University of Connecticut[iii3]**	**Newcastle University[ii10]**	University of Pennsylvania[iii]	University of Greenwich[ii]
9	Universitat Bremen[g]	University of Manchester[ii]	Yale University[iii]	University of Salford[ii]
10	Universidade de São Paulo USP[b]	Hokkaido University[j]	**The University of Auckland[nz7]**	Bangor University[ii]
11	Università di Bologna[it]	University of Alberta[c]	Uppsala University[s]	**Nottingham Trent University[1]**
12	Leiden University[n]	University of Victoria[c]	Lund University[s]	King's College London[ii]
13	University of Southern Denmark[d]	**University of British Columbia[c6]**	**University of Glasgow[ii8]**	Swansea University[ii]

	UI GreenMetric 2022 [i]	Times Higher Education Impact Rankings 2022[i]	QS World University Rankings: Sustainability 2022/23[i]	People and Planet University League 2022/2023[ii]
14	Dublin City University[ir]	Kyungpook National University[sk]	University of California, Davis[iii]	University of Worcester[ii]
15	Universidad Autónoma de Nuevo León[m]	University of Technology Sydney[a]	Aarhus University[d]	Northumbria University[ii]
16	**Université de Sherbrooke[c4]**	Chulalongkorn University[t]	University of Oxford[ii]	University of Bristol[ii]
17	Hame University of Applied Sciences[f]	University of Guelph[c]	**Western University[c9]**	University of West London[ii]
18	Leuphana Universitat Luneburg[g]	University of Indonesia[in]	**Newcastle University[10ii]**	Bath Spa University[ii]
19	Luiss University[it]	**University of Glasgow[ii8]**	University of Cambridge[ii]	Bournemouth University[ii]
20	Politecnico di Torino[it]	Kyoto University[j]	Harvard University[iii]	De Montfort University[ii]

Notes: superscript number: same university in different ranking; **university name in bold**: universities in more than one ranking; international:[i]; Australia:[a]; Brazil:[b]; Canada:[c]; Denmark:[d]; Finland:[f]; Germany:[g]; Indonesia:[in]; Ireland:[ir]; Italy:[it]; Japan:[j]; Malaysia:[m]; Mexico:[m]; Netherlands:[n]; New Zealand:[nz]; South Arabia:[sa]; South Korea:[sk]; Sweden:[s]; Thailand:[t]; UK:[ii]; US:[iii]

In the four international rankings studied, there are 16 universities in North America, 23 in Europe, eight in Asia, two in Oceania, one in Latin America, and none in Africa. North America and Europe are the two continents with the most universities in the addressed international rankings (**Figure 2**). This is where the two national rankings are based.

Map data ©2023 Google, INEGI

Notes: blue: UI GreenMetric 2022; red: Times Higher Education Impact Rankings 2022; green: QS World University Rankings: Sustainability 2022/23.

Figure 2. The geographic location of the top 20 universities in the latest iterations of the three international rankings studied

Therefore, this could suggest that the creation and application of national rankings have contributed to the leadership of North America and Europe on SD in HE. Another possible reason could be that North America and Europe have created rating systems and rankings to show SD as an area of universities' leadership in the international context. Either way, the most recent national and international ranking results suggest leadership in SD in HE in North America and Europe. This could be due to the particular emphasis on rankings and metrics combined with human and financial resources present in these two continents compared to other continents (Johnes, 2018; Pusser & Marginson, 2013). Universities in top positions of rankings tend to improve their contributions to sustainable development faster than universities in lower positions (Perchinunno & Cazzolle, 2020). Also, rankings can help drive a whole institution's approach to sustainable development at universities, as seen in **Figure 3**.

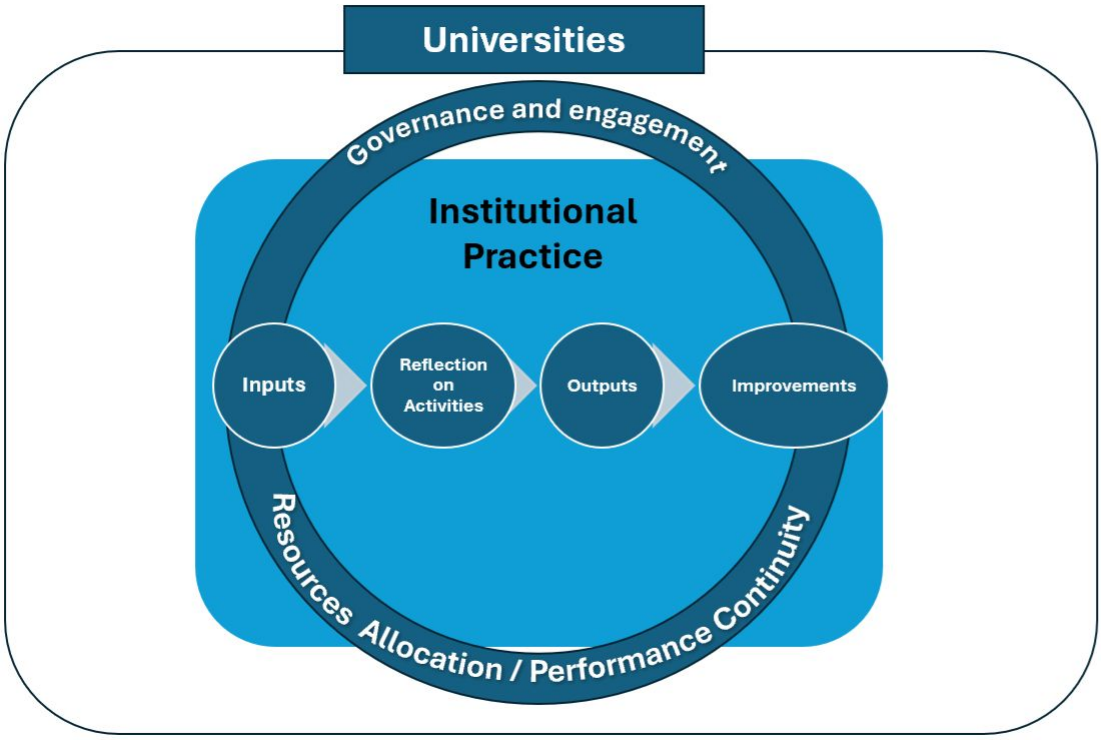

Figure 3. Advantages of sustainability ranking to the whole institution approach at universities

Further context-specific research and international comparisons are needed to ascertain the contribution of university rankings to SD in HE in different continents.

The results obtained provide a comprehensive overview of sustainability university rankings, offering valuable insights into their implications for HEIs. Sustainability ranking, assessing the SD principles in core university functions, fostering a culture of engagement and continuous improvement. These assessments have led to significant achievements, including enhanced energy efficiency, adoption of renewable energy sources, waste reduction initiatives, strengthened stakeholder engagement, and green infrastructure developments. Regional variations in participation across major ranking systems highlight the need for broader global representation. Assessment parameters across the four analysed rankings emphasise a holistic approach, covering academics, engagement, operations, planning, innovation, and leadership. The diversity in criteria and methodology ensures a comprehensive evaluation of universities' sustainability efforts. The analysis of the top 20 universities reveals structural differences and the need for context-specific rankings. The prevalence of North American and European universities in international rankings and ratings underscores the leadership of these continents in SD in HE. Further research is essential for a comprehensive understanding of the impact of rankings on SD integration across different continents.

5. Conclusions

This study aimed to assess the extent to which sustainability university rankings are used and how far they can go in assisting universities to move forward with their sustainability agendas. As demonstrated, sustainability rankings are widely spread in some regions, and their existence has led to increased motivation for universities to further engage in efforts in the field of SD. Some of the advantages of using this approach are:

i. Benchmarking and comparison: sustainability rankings provide a framework for benchmarking and comparing the organisation's sustainability performance.

Rankings can help identify leaders, highlight best practices and encourage healthy competition, ultimately driving improvements in sustainability practices across the university sector.

ii. Transparency and accountability: rankings contribute to greater transparency and accountability by publicly making sustainability information available.

iii. Risk mitigation: sustainability rankings assist in identifying potential risks and vulnerabilities within HEIs. They consider factors such as carbon emissions, resource management, supply chain transparency, labour practices, and governance, which can help highlight areas of improvement and mitigate risks associated with regulatory compliance, reputation, operational efficiency, and stakeholder trust.

iv. Stakeholder engagement: sustainability rankings engage various stakeholders, including academic staff, support staff, administration, and students, by providing accessible information on their sustainability performance.

Rankings may empower stakeholders to make informed choices, reward the institutions with sustainable practices, and – indirectly - put pressure on those lagging. This can drive positive change and encourage other organisations to enhance their sustainability efforts. Considering the lack of existing studies on this topic, this study significantly contributes to the academic literature.

Sustainability-oriented rankings can advance the sustainability agenda of universities in three main ways. Firstly, by promoting environmentally responsible practices, enhancing their reputation, and encouraging continuous improvement. Secondly, it provides a framework for universities to measure their environmental performance against standardised criteria. This helps institutions identify their strengths and weaknesses in sustainability practices. Finally, it allows universities to set specific, measurable, achievable, relevant, and time-bound (SMART) goals to improve sustainability performance.

Sustainability-oriented rankings can also significantly help universities achieve the UN SDGs by aligning their efforts and sustainability strategies to contribute directly to the SDGs, such as quality education (SDG 4), clean energy (SDG 7), and climate action (SDG 13). among others. Also, sustainability rankings may help organisations to touch on multiple SDGs simultaneously. For example, improving campus energy efficiency addresses SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). Moreover, rankings typically assess universities on their sustainability-related education and research outputs. For example, new courses and research programmes may focus on sustainable agriculture, which can directly support SDG 2 (Zero Hunger). Operational improvements triggered by rankings may also contribute to several SDGs, including SDG 6 (Clean Water and Sanitation) and SDG 11 (Sustainable Cities and Communities). Finally, rankings can further encourage universities to adopt strong governance structures and policies prioritising sustainability. This can lead to implementing sustainable procurement practices, ethical investment strategies, and inclusive decision-making processes, all of which support various SDGs such as SDG 12 (Responsible Consumption and Production) and SDG 16 (Peace, Justice, and Strong Institutions).

The implications of this paper to theory and practice are two-fold. First, the paper outlines the relationship between university rankings and sustainability, outlining the key features. Secondly, it illustrates the benefits of ranking, which, despite some limitations, present opportunities for further institutional developments.

Based on the experiences from the research, some of the measures that may be deployed as part of efforts to optimise the contribution of rankings in fostering the implementation of principles and practices of SD in a HE context may include:

i. The flexible use of sustainability criteria: Rankings must include specific criteria that assess universities' efforts and performance in promoting SD. This includes

sustainability-focused research, curriculum integration, campus operations, community engagement, and student involvement in sustainability initiatives.

ii. Provisions for collaboration and knowledge sharing: rankings can facilitate cooperation between universities by showcasing successful sustainability initiatives and encouraging knowledge sharing. By highlighting best practices, universities can learn from each other and implement effective strategies for SD.

iii. Work on institutional change: rankings can catalyse institutional change by incentivising universities to integrate sustainability principles into their core values and operations. Institutions will be motivated to invest in sustainable infrastructure, develop sustainability-focused curricula, and establish partnerships with external organisations, which may help improve their ratings.

iv. Stakeholders´ engagement: rankings should involve stakeholders such as students, faculty, staff, and local communities in the assessment process. Including their perspectives and feedback can ensure that rankings accurately reflect the sustainability efforts and impacts of universities, fostering a sense of ownership and commitment to SD.

Periodic assessments, allowing improvements, is another measure to mention. Rankings are subject to periodic assessments, ensuring they remain relevant and effective in promoting SD. The continuous refinement based on stakeholder feedback, emerging sustainability trends, and evolving global challenges will enhance the rankings' ability to drive positive change. Through these strategies, rankings can effectively contribute to implementing SD principles and practices in a HE context, inspiring universities to prioritise sustainability, encourage collaboration and knowledge sharing, and drive institutional change towards a more sustainable future. While sustainability rankings have their merits, they vary in methodology and scope, and organisations may focus on improving their ranking rather than addressing the broader sustainability agenda. Therefore, multiple sources of information are considered, and an in-depth analysis of benefits is undertaken to understand an organisation's sustainability performance comprehensively.

This paper has some limitations. One of them is that emphasis was given to 20 universities in the three international rankings, and one national ranking was investigated. Other institutions were not included and may be analysed in different studies. A second limitation is connected with the fact that rankings with a broader approach should have been considered. Despite these limitations, the paper contributes to the literature since these rankings reflect the growing importance of sustainability in higher education, showing a clear shift in how universities are being evaluated in response to global challenges.

Competing Interests statement

The authors declare no competing interests.

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