



***Advancing Campus Sustainability.
 Practices in European Higher Education
 Wspieranie zrównoważonego rozwoju kampusów.
 Praktyki w europejskim szkolnictwie wyższym***

ABSTRACT

RESEARCH OBJECTIVE: The study examines how top European universities incorporate sustainability into their campus infrastructure, focusing on Sustainable Development Goals (SDGs 6, 7, 11, 12, 13). Although interest in sustainability is increasing, strategies and infrastructure at the campus level are underexplored. The research highlights the gap between declared sustainability commitments and practical actions.

THE RESEARCH PROBLEM AND METHODS: Using Times Higher Education Impact Rankings and qualitative desk research, a mixed-method approach was applied to analyze six leading EU universities.

THE PROCESS OF ARGUMENTATION: Higher education institutions (HEIs) are key to sustainability, but harm the environment through resource use, commuting, and high energy and water consumption. Their large infrastructures produce significant organic waste, increasing emissions. At the same time, many excel in sustainability.

RESEARCH RESULTS: The study found SDG 11 (sustainable communities) was frequently addressed, while SDG 6 (clean water) was the least reported. Universities often express intentions rather than outcomes; a lack of English-language information limits transparency. Many top-ranked institutions do not prioritize campus sustainability due to non-standard metrics, fragmented communication, and inconsistent reporting.

CONCLUSIONS, RECOMMENDATIONS AND APPLICABLE VALUE OF RESEARCH: The authors suggest enhancing data access, standardizing measurement tools, and including non-ranked universities in further research to provide a comprehensive view of sustainability in higher education.

This has practical implications for policy, governance, and international collaboration on sustainable campus development.

→ **KEYWORDS:** **UNIVERSITY SUSTAINABILITY, CLIMATE CHANGE, SDG, SUSTAINABLE CAMPUS, ECOLOGY**

STRESZCZENIE

CEL NAUKOWY: Badanie analizuje, w jaki sposób czołowe europejskie uczelnie integrują zasady zrównoważonego rozwoju w infrastrukturze kampusów, koncentrując się na Celach Zrównoważonego Rozwoju (SDG) 6, 7, 11, 12 i 13. Pomimo rosnącego zainteresowania zrównoważonym rozwojem strategii i infrastruktury na poziomie kampusów pozostają słabo zbadane. Badanie uwidacznia rozbieżność między deklarowanymi zobowiązaniami a praktycznymi działaniami.

PROBLEM I METODY BADAWCZE: Zastosowano podejście mieszane – wykorzystano rankingi Times Higher Education Impact Rankings oraz jakościowe badania danych zastanych do analizy sześciu wiodących uniwersytetów w Unii Europejskiej.

PROCES WYWODU: Szkoły wyższe odgrywają kluczową rolę w promowaniu zrównoważonego rozwoju, ale jednocześnie szkodzą środowisku przez zużycie zasobów, dojazdy oraz wysokie zużycie energii i wody. Ich rozbudowana infrastruktura generuje znaczne ilości odpadów organicznych, zwiększając emisje. Pomimo tego wiele uczelni osiąga sukcesy w dziedzinie zrównoważonego rozwoju.

WYNIKI BADAŃ: Stwierdzono, że SDG 11 (zrównoważone miasta i społeczności) jest najczęściej uwzględniany, podczas gdy SDG 6 (czysta woda i warunki sanitarne) jest raportowany najrzadziej. Uczelnie częściej wyrażają zamiary, niż przedstawiają konkretne wyniki, a brak informacji w języku angielskim ogranicza transparentność. Wiele wysoko ocenianych instytucji nie traktuje zrównoważonego rozwoju kampusu jako priorytetu z powodu niestandardowych wskaźników, fragmentarycznej komunikacji i niespójnego raportowania.

WNIOSKI, REKOMENDACJE I APLIKACYJNE ZNACZENIE WPŁYWU BADAŃ: Autorzy sugerują poprawę dostępu do danych, standaryzację narzędzi pomiarowych oraz uwzględnienie w dalszych badaniach także uczelni spoza rankingów, aby uzyskać pełniejszy obraz zrównoważonego rozwoju w szkolnictwie wyższym. Ma to praktyczne znaczenie dla polityki, zarządzania i międzynarodowej współpracy w zakresie zrównoważonego rozwoju kampusów.

→ **SŁOWA KLUCZOWE:** **ZRÓWNOWAŻONY ROZWÓJ UCZELNI, ZMIANY KLIMATU, SDG, ZRÓWNOWAŻONY KAMPUS, EKOLOGIA**

Introduction

This paper explores the implementation of the United Nations Sustainable Development Goals (SDGs) and eco-friendly campus practices in European universities. The United

Nations Sustainable Development Goals (SDGs) provide a comprehensive global framework aimed at addressing pressing social, economic, and environmental challenges by 2030. Environmental sustainability is vital for maintaining the integrity of human social and economic systems, promoting development without compromising natural resources.

A sustainable university minimizes negative impacts while fulfilling its educational, research, and partner outreach roles to aid in transitioning to sustainable lifestyles (Vellazquez et al., 2006). Universities are crucial in promoting social justice, equity, and economic opportunities through knowledge creation and dissemination (Alcántara-Rubio et al., 2022) and educating future leaders in sustainability (Dlouhá et al., 2019). They integrate sustainability into daily operations and model transformation to impact students (Bui et al., 2023).

To align with businesses and achieve the SDGs, European universities must enhance their sustainability efforts amidst challenges like carbon neutrality and resource management. A standardized approach is necessary for evaluating SDG impact (Kettlhoilwe et al., 2019).

This paper examines how leading European universities implement campus sustainability SDGs, focusing on their 2023 THE Impact Ranking (THE IR) results (which require evidence of relevant activities).

THE IR provides a framework for assessing universities' contributions to the SDGs, but has inherent limitations. Not all leading universities participate due to data reporting challenges or the methodology used in these rankings. Therefore, THE IR doesn't cover all universities making significant societal and environmental impacts. Hence, an institution's absence from THE IR does not imply a lack of impact.

Gadd (2020) criticizes university rankings like THE IR and QS for failing to measure what truly matters, such as open access, diversity, and sustainability. It argues that these rankings lack rigor and transparency, often favoring simplistic metrics over nuanced evaluations. The paper calls for accountability and the adoption of fairer assessment methods that align with the broader values of higher education. It suggests a need for change to create more responsible and meaningful evaluations of universities.

Literature Review

Universities can become sustainability leaders if the green campus approach becomes an opportunity for cultural change (Mahdee et al., 2022). Like small cities, campuses have autonomous governance and diverse infrastructure, making them suitable for implementing ecocity principles. Sustainable campuses embody and educate about environmental stewardship, aiming to benefit both society and the planet. Due to their long-term development and centralized administration, HEIs are ideal for exploring carbon reduction strategies (Sonetti et al., 2016).

HEIs are crucial for sustainability, but harm the environment through resource exploitation, commuting, and high energy and water use. Their extensive infrastructure

causes significant organic waste, requiring energy to process and increasing emissions (Filimonau, 2021). While no campus fully follows ecocity principles, many excel in sustainability, which usually begins with grass-roots small projects rather than a significant shift. Faculty and staff typically act as change agents while struggling with limited resources, a lack of understanding of university management, and restricted decision-making access (Duram & Williams, 2015). Despite their enthusiasm and ideas, structural and procedural challenges can impede student progress.

A common advancement in sustainability is campus gardens, which are usually part of courses, programs, or projects (Ridgeway & Matthews, 2015) and promote responsibility and technical skills among students and faculty.

"Smart campuses" are an emerging trend, aiming to transform higher education institutions (HEIs) (Polin et al., 2023). by leveraging digital transformation, such as smart buildings and IoT devices, to enhance sustainability. This approach focuses on improving energy efficiency, reducing carbon emissions, optimizing resources, and improving overall sustainability performance.

University campuses often face environmental challenges due to aging infrastructure. Sustainable practices involve energy efficiency, water conservation, waste reduction, carbon neutrality, sustainable transport, green design, equity, fair labor, sustainable food, and planning.

Research shows green campuses use green technology and the economy to tackle sustainability challenges (Shishakly et al., 2024). Smart campuses are an emerging trend, aiming to transform higher education institutions (HEIs) (Polin et al., 2023) by leveraging digital transformation, such as smart buildings and IoT devices, to enhance sustainability. This approach focuses on improving energy efficiency, reducing carbon emissions, optimizing resources, and improving overall sustainability performance (Martins et al., 2021).

Methods

The research took place between April and August 2024 and focused on identifying best practices in campus sustainability at leading European universities. The study helped to answer the research question: How do leading European universities implement environmentally sustainable development practices on their campuses?

The research process consisted of eight stages:

1. sample selection among the EU's universities;
2. analysis of international sustainable university rankings – Green Metrics, THE IR, and The QS World University Rankings: Sustainability. THE IR was chosen because it concentrates on SDGs and is publicly accessible without any fee;
3. analysis of the thematic scope of each SDG and the reported information required by THE IR and selection of SDGs relevant to campus sustainability (SDG 6: Clean water and sanitation, SDG 7: Affordable and clean energy, SDG 11:

- Sustainable cities and communities, SDG 12: Responsible consumption and production, SDG 13: Climate action);
4. identification of top five universities in each EU country in SDG implementation in THE IR ranking for 2022 (the ranking results were published in June 2023;
 5. identification of scores and ranking positions of each of the 101 universities in the context of selected SDGs.
 6. results' coding based on ranking positions, assigning scores (table 1);
 7. identification of universities with the best results.
 8. final selection of six (two universities in fifth place) leading European universities (table 2), their websites analysis to conduct a case study analysis.

Table 1. Coding scheme for the green campus performance

Place in THE IMPACT ranking	Points
801+	1
601–800	2
401–600	3
301–400	4
201–300	5
101–200	6
51–100	7
1–50	8

Source: own elaboration.

To avoid language bias, English versions of the websites were analysed, which provided less information than the websites in the mother tongues, which is a study limitation.

Table 2. The top six leading universities in selected SDGs

COUNTRY	UNIVERSITY	RANK	SDG 6	SDG 7	SDG 11	SDG 12	SDG 13	Total
Denmark	Aalborg University	9	8	8	8	8	8	40
Spain	University of Jaén	101–200	8	8	7	6	7	36
Portugal	University of Coimbra	29	6	6	8	6	8	34
France	IMT Atlantique	101–200	6	8	4	7	8	33
Belgium	Université Catholique de Louvain	101–200	5	7	7	5	7	31
Spain	University of Girona	101–200	7	6	6	6	6	31

Source: own elaboration.

Results

The analysis evaluates universities' reporting on selected SDGs. Prioritizing a green campus is rare among top-ranked universities. A research tool focusing on five essential SDGs – a cornerstone for sustainable campuses – was employed. Out of 101 universities,

13 do not report any activity related to the chosen SDGs, while 22 engage with only one SDG, mainly SDG 11. The top 10 universities cover activities across all selected SDGs. SDG 11 is the most reported (65 universities), whereas SDG 6 is the least (34 universities), with SDG 6 also reflecting the lowest scores (total: 177; average: 5.2 per university). In contrast, universities score highest in SDG 13 (total: 354; average: 5.8).

The research examines university rankings and content from six leading HEIs, highlighting the difficulty in accessing information on their websites, especially regarding SDGs. Although universities are transparent about their SDG research projects, particularly for goals 6 and 7, concrete conservation practices are harder to track down. Universities often outline future plans rather than achieved outcomes. SDG 11 projects focus on sustainable commuting, like shared transportation solutions. Specific practices related to SDG 7 include adapting energy systems and investing in efficient buildings, driven by both sustainability goals and financial pressures in Europe's energy market.

For SDG6, water-saving measures such as leak detection and rainwater use for gardening are common. SDG12 practices are more challenging to identify and report, but often include waste sorting, recycling, and reducing plastic use, with some universities also addressing sustainable meals and food waste. SDG11 practices are described as vague and interconnected with other SDGs, focusing on general footprint reduction and sustainable transportation, often in collaboration with local communities.

There is a need for better communication of sustainable development efforts at EU university campuses. The lack of English-language content on university websites and in policy documents limits the global reach and comparative research potential of these initiatives. Providing comprehensive information in both native languages and English enhances accessibility and openness.

Discussion

Universities are integral to advancing SDGs through initiatives like sustainable campus practices, waste management, and educational programs. While these efforts build stakeholder awareness, their financial and organizational challenges necessitate prioritization, particularly early on. However, sustainable practices can yield cost savings (Zhang et al., 2017) and improved recycling rates. The environmental dimension is deemed the most critical aspect of university sustainability (Wright & Wilson, 2012). Moreover, well-managed campus ecosystems enhance student well-being and require careful planning involving biodiversity and expert support.

University campuses offer ecosystem services that significantly improve students' physical and mental well-being (Nguyen & Truong, 2024). The campus ecosystem (comprised of living organisms like animals and plants and non-living elements like soil and water) must be well-managed to minimize waste and pollution (Dave et al., 2014). Actions aimed at biodiversity and ecosystem services should be part of general planning and supported by experts. All these activities need careful planning, budgeting, and design.

Universities are key players in sustainable waste management, serving as societal models and fostering innovation. They contribute to sustainability through comprehensive waste management policies and knowledge sharing of both local practices (Falsini et al., 2019) and international best approaches. A circular approach to waste management is crucial (Giurea et al., 2024), affecting university rankings and sustainability goals. Universities should consider variations in waste generation patterns and involve students, dining services, and administration to ensure the success of sustainable initiatives (Posner & Stewart, 2013).

As research and innovation centers, universities contribute to reducing greenhouse gas emissions by developing measurement tools, technologies, and sustainable management strategies. Their efforts not only benefit universities but also support local communities by decreasing ecological footprints through efficient energy (Patil & Tanavade, 2024) and water use, among other strategies, and promoting sustainable behavior (Adjei et al., 2021). Despite varying methods, carbon footprint assessments are increasingly common (Valls-Val & Bovea, 2021). Reduction strategies include green campus projects, energy efficiency, renewable energy integration, and promoting behavior change.

Campus buildings are large energy consumers, contributing to greenhouse gas emissions. Irresponsible energy use harms ecosystems and accelerates climate change. Universities implement energy-saving measures, use renewable energy, or adopt eco-friendly heating and cooling. Some have reduced resource usage through targeted campaigns (Lambert & Cushing, 2017).

Clean water availability is a critical sustainability concern, affected by location and climate (Dave et al., 2014). In 2019, 29% of the EU territory and 39% of the EU population faced water scarcity (European Environment Agency, 2023). As water shortages impact the environment and social systems (O'Hara & Naicker, 2022), universities can collect and reuse rainwater and greywater for irrigation, provide free clean water, and install automatic water systems and monitoring.

Full-time higher education students influence travel habits, emphasizing sustainable commuting to lessen environmental impact. Universities enhance sustainable transport, benefiting the environment and student life (Kaplan, 2015). Although walking, cycling, and public transit are crucial, their adoption can improve with better convenience, infrastructure, and attitudes (Ribeiro et al., 2020). Strategies like Transportation Demand Management, greenways, and electric transit improvements are employed (Fadhil & Waheeb, 2021). By promoting sustainable mobility, universities model practices for communities via free public transport permits and high parking fees, encouraging low-carbon commuting. Collaborations with local governments enhance bicycle lanes, public transport, and infrastructure, offering safer car alternatives. Bike storage, showers, and incentives for biking or carpooling further support low-carbon transport, contributing to a healthier environment (Versteijlen et al., 2021).

Conclusions

The analysis reviewed top universities' reports and websites regarding five key Sustainable Development Goals (SDGs) crucial for a sustainable campus: SDG 6, 7, 11, 12, and 13. It found that prioritizing a green campus is not common among top-ranked universities.

The research shows that a green campus among the top-ranked universities from THE IR is not a priority. The top 10 universities regarding campus sustainability in the THE IR report activities under all selected SDGs. Thirteen of the 101 universities studied do not report on activities under the selected SDGs. In contrast, 22 universities report activities in only one of the chosen SDGs (6, 7, 11, 12, 13).

Universities report most frequently under SDG 11 (65 universities) and least often (34 universities) under SDG 6. They also achieve the weakest ranking positions under this goal. HEIs ranked highest in SDG 13.

Universities often excel at articulating their commitment to environmentally friendly practices, showcasing initiatives such as energy-efficient buildings, waste reduction programs, and sustainable transportation options. However, the challenge lies not in describing these good practices but in quantifying and assessing their effectiveness. Measuring progress requires metrics and data collection methods that can accurately reflect the impact of sustainability initiatives over time. This complexity is compounded by the diverse nature of university operations and the varying levels of stakeholder engagement. Consequently, while universities may present a compelling sustainability narrative, the actual test of their commitment is found in their ability to systematically evaluate outcomes, adapt strategies based on data-driven insights, and transparently report on their progress. This gap between intention and measurement underscores the need for a more structured approach to sustainability assessment in higher education.

THE IR platform is in English and requires evidence of activities aligned with SDGs in this language. Intuitively, this information in English should be included on university websites. Despite preparing it for rankings, top European universities do not provide this information online. Displaying these practices would set a benchmark for others and offer insights into sustainability at HEIs. This research's sample is a significant limitation; rankings use limited indicators, possibly missing the full range of sustainability efforts. We focused only on European universities, which introduces geographical bias, as universities in other regions, particularly low-income countries, face different challenges.

The study examines how SDGs are implemented in leading EU universities per THE IR, selecting six top institutions to explore leaders' sustainability activities. More university-specific case studies are needed for deeper insights into SDG implementation. Future research should emphasize sustainability metrics at universities, as the SDGs framework needs more standardization and clear evaluation criteria. Additionally, research should address sustainability policies and governance, including strategic campus sustainability.

While THE IR provides valuable insights, it represents only one perspective and a limited number of universities. A holistic evaluation of university impact should include

diverse sources and methods to capture the multifaceted nature of institutional contributions to society and the natural environment. To provide a more comprehensive analysis, it is crucial for further research to consider universities that are not included in THE IR. While direct comparisons with non-ranked universities will be challenging due to the lack of standardized data, alternative evaluations of impact can offer some insights. For example, national assessments and independent reports often highlight the strengths of EU universities. It is a necessary next step, as many institutions have been recognized for their commitment to advancing the SDGs, even though they may not participate in THE IR.

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