

Sustainability Assessment of Higher Education Institutions: A Systematic Literature Review[†]

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Abstract: Higher education institutions (HEIs) are crucial social organizations that foster innovation, disseminate knowledge, and train future leaders in various fields. Higher education institutions are essential for implementing the Education for Sustainable Development (ESD) plan. This review addresses HEIs' attempts to evaluate sustainability in higher education. This study analyzes the literature available on the sustainability assessment of higher education institutions to provide a review of the practices incorporated by different HEIs around the globe. Using the Scopus database and Google Scholar, 88 articles were selected for this review. The analyzed literature provided information that helped compile an SAT list (Sustainability Assessment Tool). The SATs identified in these articles are categorized as qualitative, quantitative, and mixed-method techniques. The utilization of these SATs in real-world case studies was also presented, and their results are highlighted. This analysis aids and contributes to current research on using these SATs and other methods for evaluating and implementing the sustainability of HEIs. This study also explains the difficulties and scope of utilizing these SATs in the actual world.

Keywords: sustainability assessment; sustainable practices; green practices; universities; colleges; campus; higher education institutes; HEI



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1. Introduction

Sustainable development safeguards economic and socially important environmental services and resources. The ideal community safeguards the biological system while providing resources and housing. The 1987 Brundtland Report defined sustainable development as “growth that meets the aspirations of the current generation without jeopardizing the capacity of future generations to satisfy their demands”. This definition addresses economic and social growth with a foundation of environmental protection and sustainable development [1]. Since then, regional, national, and municipal HEI sustainability announcements have garnered attention [2].

Many research evaluations have examined higher education sustainability assessment tools (SATs). Eleven cross-institutional evaluation tools were reviewed to establish their development stage and closeness to the “ideal tool” [3]. Ref. [4] statistically and qualitatively assessed HEI assessment tool issues and methodologies using 16 SATs. Ref. [5] used several techniques to consider a real-world case study. Ref. [6] evaluated ESD implementation techniques in two case studies. Bullock, G. [7] utilized the GRI-HE, a framework based on criteria borrowed from the Global Reporting Initiative and the Association of University Leaders for a Sustainable Future, to evaluate nine publicly accessible frameworks for HEI sustainability. Ref. [8] evaluated assessment tools to extrapolate the major elements used to rank sustainability assessment systems and combine them into a full technique to evaluate current systems and pick the best for public use.

According to various writers, these evaluations have substantially increased our knowledge of how HEIs analyze sustainability, but their execution still needs improvement. A sustainable university is still under development [5,9,10]. Assessment tools must be used for practical applications and integrated into higher education institution agents' processes. ESD at HEIs has spawned numerous evaluation and benchmarking methodologies [11]. By comparing the indicators, criteria, and introductions of twelve sustainability assessment tools, ref. [10] showed how different industries and subjects dominate and are marginalized. However, how case studies are conducted and how they assess sustainability and advantages are still unknown.

This paper systematically reviews the literature on sustainability evaluation in higher education institutions to present an integrated picture of the assessment approaches used by various universities worldwide. Furthermore, this study examines case studies that use these approaches to learn more. This study updates the HEI sustainability evaluation literature and identifies best practices.

2. Method of Research

This work reviewed Scopus and Google Scholar publications using keywords and search terms, as shown in Table 1. English-language, peer-reviewed scientific journals were used for all articles. Since sustainable assessment literature demands clarity, several keywords were searched in article titles and abstracts.

Table 1. Method for the article selection for the review.

Particulars	Details
Keywords Used	Sustainability Assessment, Sustainable Practices, Green Practices, University, Colleges, Campus, Higher Education Institutes, and HEI.
Databases Used	Scopus and Google Scholar
Initial Search	652 Articles
Inclusion Criteria	"Only Articles, Language: English, Year range 2000–2023"
Excluded Subject Areas	"Decision Sciences, Materials Science, Chemical Engineering, Chemistry Nursing, Health Professions, Mathematics, Biochemistry, Genetics, Molecular Biology, Psychology, Immunology, Microbiology, Pharmacology, Toxicology, and Pharmaceuticals".
Number of Screened Articles	150
Number of Final Articles	88

3. Results and Discussion

This study reviewed 88 publications and SAT data from institutions worldwide. SATs were quantitative, qualitative, and mixed. This review showed case study tools. The Sustainability Assessment Questionnaire was the main qualitative instrument (SAQ). EFA, CSAF, uD-SiM, AISHE, UI Greenmetric World University Rankings (WUR), and Life Cycle Assessment were the key quantitative instruments (LCA). STARS, A&A Framework/UEMS, and SWOT analysis dominated the mixed techniques. Real-world SATs were not included in previous studies.

As HEIs prioritize sustainability, some institutions are launching sustainable programs. ESD programs in HEIs are essential [12]. University enrolment has increased but only in certain fields as per the literature available [13]. Sustainability issues have forced HEIs to adapt their operations, facilities, and corporate culture [14].

Universities prioritize environmental innovation [15]. HEI programs, research, and outreach enhance SDG 4 (Quality Education) [16]. Studying increased eco-awareness for most students [17]. Green campus operations, administration, organization, and leadership; teaching, research, and services; campus-wide actions and activities; the institutional monitoring of campus sustainability measures; and proven ways to overcome obstacles contribute to environmental sustainability [18]. Business school research improves organi-

zations, systems, and social and environmental challenges, impacting the economy, law, and education. Climate, social structure, culture, traditional beliefs, and regulations affect Campus Sustainability approaches [19,20].

SATs identify areas for improvement, make strategies for campus sustainability improvement, and foster a sustainability culture to execute sustainability [21]. Beyond eco-efficiency, SATs should emphasize important issues and be quantitative, comparable, and unambiguous [3]. Higher education institutions require sustainability guidance and a comparison method [22]. Instruments seldom permit institution comparisons. These tools may be based on indicators and conceptual models that support sustainability choices and enable rapid and wide communication, understanding how to react to tough processes and research the sustainability transition [11].

The literature on HEI sustainability assessment the authors' aims are summarized below. It comprises educational institutions' tools and practices throughout time and at different locations. Three categories separate these tools: quantitative, qualitative, and mixed techniques (comprising both quantitative and qualitative).

3.1. Qualitative Methods

3.1.1. Graz Model for Integrative Development (GMID)

The sustainability process transformational potential assessment model. Ref. [23] analyzed sustainability practices' transformational potential.

3.1.2. Adaptable Model for Assessing Sustainability (AMAS)

This tool uses metrics and standards for environmental management, social responsibility, and economic sustainability [22].

3.1.3. Sustainability Assessment Questionnaire (SAQ)

The qualitative SAQ covers environmental management, social responsibility, and economic sustainability. The questions assist institutions to understand their sustainability performance strengths and shortcomings and create improvement strategies. Ref. [12] investigated sustainable teaching, curricula, research, campus operations, administration, and financial management. Ref. [1] polled students on university operations, community participation, research, and curricula.

3.1.4. American College & University Presidents' Climate Commitment (ACUPCC)

US higher education institutions make a qualitative commitment to carbon neutrality and climate change via numerous activities and projects. Ref. [24] compared this technique to STARS and the Green Report Card.

3.1.5. Sustainability Tool for Auditing Universities Curricula in Higher Education (STAUNCH)

The UK Higher Education Academy created this qualitative sustainability evaluation instrument (HEA). It helps colleges audit and assess their programs to include sustainability ideas. Users evaluate their curricula's sustainability content using the tool's questions and suggestions. It also covers utilizing assessment findings to create and execute sustainability plans. The tool is versatile and adaptable to many fields. Auditing 5800 course descriptions from 19 of 28 Cardiff University schools enabled SD implementation and distribution [25].

3.2. Quantitative Methods

3.2.1. Ecological Footprint Analysis (EFA)

EFA quantifies the life cycle environmental performance of items and systems. Ref. [26] conducted the first institutional-level EFA at Newcastle University (NSW), Australia. Ref. [27] utilizes EFA to address the question, "How large is Redlands' ecological impact?" His work [28] identifies practical EFs and recommends policies to mitigate environmen-

tal impacts on college campuses. Ref. [29] examined the consumption-based ecological footprint technique (EFM) and its application to quantify university campus sustainability.

3.2.2. Graphical Assessment of Sustainability in Universities Tool (GASU)

The GASU tool graphs the institution's sustainability performance to assist in identifying areas for improvement and measuring progress. Ref. [30] analyzed tools to assess and report academic institutions' sustainability activities, revised the Global Reporting Initiative (GRI) Sustainability Guidelines, and created the GASU, a simplified graphical overview of tool indicators.

3.2.3. Three-Dimensional University Ranking (TUR)

The TUR ranks universities based on research, outreach, and stewardship. It rates each dimension using quantitative indicators and then ranks them. Ref. [31] suggested comparing university research, pedagogical, and environmental performance to fulfill the sustainability concept.

3.2.4. uD-SiM Model

This model quantifies urban design and sustainability studies. This fuzzy multi-criteria assessment technique [32,33] may assist higher education institutions to evaluate sustainability.

3.2.5. Green Report Card

US institutions use the Green Report Card to quantify sustainability. The Sustainable Endowments Institute scores institutions on energy efficiency, transportation, water consumption, and trash management. The STARS and ACUPCC approaches were compared in [24].

3.3. *Mixed Methods (Both Qualitative and Quantitative)*

3.3.1. University Environment Management System (UEMS)

The UEMS aids universities in environmental management and sustainability. It advises creating and executing a university-specific environmental management system (EMS). The framework is based on ISO 14001, but it is tailored to institutions' special needs. The UEMS covers environmental reviews, goals, targets, management plans, and performance monitoring and reporting. It stresses stakeholder engagement and university sustainability [34]. It was utilized in [35] to assess an Indian university's sustainability and in [36] at AU, India, to study the EF's main attributes and set campus environmental rules.

3.3.2. SWOT Analysis

Strategic planning may uncover an organization's internal strengths and weaknesses and external opportunities and dangers. SWOT analysis entails analyzing internal and external variables that impact an organization's performance and competitiveness and creating a market improvement strategy. In their research, ref. [37] proposed an EMS paradigm for Indian institutions. Ref. [38] used it to examine UNDIP's sustainable development and its relation with higher education institutions (HEIs).

3.3.3. Sustainability Tracking, Assessment, and Rating System (STARS)

The Association for the Advancement of Sustainability in Higher Education designed a voluntary sustainability rating system for colleges and universities (AASHE). STARS increases academic, engagement, operational, and planning and administration sustainability. Criteria and performance indicators determine sustainability in each area. Surveys, audits, and other data indicate scores. An institution's sustainability score is ranked from bronze to platinum. STARS is a comprehensive sustainability tool for all enterprises. It was used to evaluate the University of Saskatchewan [39] and to assess 21 Canadian HEI sustainability policies. Refs. [40–42] used STARS online performance sustainability data from the same

institutions to see whether management sustainability culture affects worldwide university rankings. It analyzed Indian HEI sustainability. Refs. [43,44] gave national authorities HEI sustainability measures.

4. Conclusions and Future Scope

Outreach, teaching, and research should support sustainability in HEIs [45]. Assessment methodologies increasingly affect HEIs. We provide HEI sustainability assessment evaluation framework case studies. Quantitative, qualitative, and mixed-method research exist. Other methods can support HEIs. To help academics understand frameworks' pros and cons, this study's literature review shows HEI sustainability assessment. This review may help HEI sustainability scholars conducting research in this area or wish to conduct similar research in future.

This study examined higher education sustainability evaluation literature for sustainability assessment methods and case studies. This article adds case studies on sustainability evaluation at HEIs to earlier sustainability assessment research. Overall, 88 peer-reviewed articles are examined. Sustainability evaluation drives early diagnosis, plan creation, and management modifications in HEI case studies. Qualitative, quantitative, and mixed methods reveal the most prevalent SATs. This may assist future academics in adopting a sustainability assessment method for positive HEIs. Real-life case studies on HEI sustainability assessment are included in this review research. This study evaluates HEI sustainability. It examines this field's research methodologies, strengths, shortcomings, and possibilities. This review may inform higher education sustainability assessment research. This research eliminates rare methods. HEI sustainability assessment methods need data. In the long term, using a different database, like SCOPUS, Web of Science, etc., will allow for a more thorough analysis.

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