



## Implementing the Sustainable Development Goals in University Higher Education: A Systematic Review

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<https://doi.org/10.18280/ijstdp.180612>

### ABSTRACT

**Received:** 8 March 2023

**Accepted:** 4 May 2023

#### Keywords:

*agenda 2030, science, education, university, sustainability*

The role of higher education institutions in promoting sustainability is realised through scientific research and academic activities. It is therefore essential to explore strategies to assess and monitor the implementation of sustainable practices in these institutions. This study set out to examine the mainstreaming of the Sustainable Development Goals (SDGs) in higher education institutions. The methodology used was a systematic review of research articles in the Scopus database, conducted between 6 and 20 January 2023. The inclusion criteria covered global university experiences in implementing the SDGs. The review revealed that 28.56% of the publications included were from European universities, 24% from the Americas, 13% from Asia and a smaller number from Oceania (5%) and Africa (2%). The analysis identified indicators to assess adherence to the SDGs, such as number of publications, institutional affiliation, number of reports, disciplinary field, type of course, number of essays, subject area, student/classroom ratio and age of participants. The data collection instruments used were questionnaires, interviews, published articles and field notes. This systematic review details the concern of higher education institutions to measure the impact of their activities in relation to the SDG guidelines, as well as a critical and decision-oriented summary for institutions wishing to initiate the process.

## 1. INTRODUCTION

Due to the large number of articles and publications, the simple and complete way to use them is through a compilation of the information, but given the scarcity of time, the proliferation of information, and the lack of basic knowledge [1] systematic reviews (SR) were developed [2]. Taking into account that the SR is a synthesis article of available evidence, in which a review of quantitative and qualitative aspects of primary studies is carried out, with the aim of summarising the existing information on a particular topic [3] and must be carried out on the basis of a protocol [4]. The stages for conducting a SR include: defining its purpose, formulating the question, searching the literature, evaluating the data, analysing the data, and presenting the results [5, 6]. This is the case of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, which includes: (i) correctly formulating the question to be answered, (ii) developing the protocol (inclusion and exclusion criteria), (iii) a detailed and extensive literature search, (iv) screening the abstracts of the papers identified in the search and subsequently the selected full texts [7]. The PRISMA statement, published in 2009, was designed to help authors of systematic reviews to transparently document the rationale for the review [8].

In 2015, the member states of the United Nations approved the 2030 Agenda for Sustainable Development [9], which is presented as a new global and local social contract that requires the creation of mechanisms to cooperate and make progress in achieving the SDGs [10]. This agenda considers a global action plan to eradicate poverty and promote sustainable development in five areas: people, planet, prosperity, peace and partnership. The SDGs comprise 17 goals and 169 targets addressing economic, social and environmental aspects [11-13], therefore the need to address the goals are in relation to each other and not separately or sequentially; however, the importance of education for sustainable development is recognised through SDG 4, which states to provide inclusive and equitable quality education and promote lifelong learning opportunities for all [14] and as a fundamental element for the achievement of: end poverty (SDG 1); health and well-being (SDG 3); gender equality (SDG 5); decent work and economic growth (SDG 8); responsible production and consumption (SDG 12); climate action (SDG 13); and peace, justice and strong institutions (SDG 16) [15].

In addition, the 2030 Agenda proposes several policy guidelines and tools to assist in the process of mitigation and orientation towards green growth [16] and introduces a preliminary set of 330 indicators; however, some SDGs build

on previous Millennium Development Goals, while others incorporate new ideas [17] that propose a plan of action for people, prosperity and the promotion of peace, through the establishment of partnerships between various sectors and countries [18]. The guidelines for the implementation of the SDGs in higher education institutions structure their work in four (4) areas of action: research (solutions and the necessary innovations), education, management and governance (University Social Responsibility); and social leadership (partnerships and coordination systems between countries and, within countries, between different social actors) [19].

The role of universities in the pursuit of these goals is of considerable importance. Universities are knowledge institutions engaged in the disciplinary areas needed to ensure SDG implementation [20], are uniquely positioned to lead their cross-sectoral implementation, and can promote transformative innovation across the curriculum, as well as engage in joint initiatives with the local community [21]. Higher education also helps in the implementation of a wide range of SDGs.

The threefold teaching-research-service mission fosters a sustainability mindset in students [11, 22]. Universities therefore have an important role to play in ensuring that graduates can address issues related to sustainable development and the achievement of the SDGs by 2030 [23]. However, many have an unclear understanding of their importance or how to effectively integrate them into their curriculum [11]. While sustainability is not a new issue, a framework is still needed to comprehensively cover the 17 SDGs and their multiple areas of analysis [24], as there is a great risk of entrusting strategic decisions to those without sustainability expertise [25], and there is a need to ensure that universities are involved in the process. Despite this, Serafini [18] states that universities are moving to support the implementation of the 2030 Agenda, generating initiatives in institutions around the world to achieve the SDGs. In this context, the aim of the research was to analyse and explore how the Sustainable Development Goals (SDGs) are being mainstreamed in university higher education institutions through systematic reviews applying the PRISMA Statement method. The expected outcome is to provide an overview of the SDG implementation process in universities and the assessment indicators used in different countries.

## 2. MATERIALS AND METHODS

### 2.1 Information sources and search equation

A systematic review was conducted following the recommendations proposed by the Cochrane Handbook [26] and the PRISMA statement [4]. This methodology aims to improve the quality of systematic reviews by using a list of checklist items. In general, PRISMA performs four important steps: searching with keywords and appropriate databases, screening through inclusive and exclusive characteristics, synthesis by categorising the data, and finally, analysis of data that can explain the results of the article [18, 27].

In this study, manuscripts from scientific journals indexed in Scopus were reviewed, the search equation contemplated the terms: sustainable development goals and research and university, in the titles, abstracts and keywords. The choice of Scopus journals is justified because it is a database where multidisciplinary scientific literature is referenced, widely

accepted by researchers, and includes high-impact articles in various areas. In addition, it is part of one of the largest online collections of scientific research in the world, ScienceDirect, managed and operated by the Publisher Elsevier [28].

After the search results, the guidelines for choosing the work to be analysed were: first, to select them by title and by reading the abstract in order to know the relationship with the aspects to be analysed; second, the content of the chosen articles was analysed in order to know if the contribution to this work could be useful for the fulfilment of the research objective [29].

### 2.2 Inclusion and exclusion criterion

We included papers from higher education institutions that included experiences of implementing the SDGs in management, teaching and research processes. In addition, systematic reviews, bibliometric reviews, conference notes and proceedings were considered in order to address a larger number of documents.

The search was not limited by year of publication and only documents published in English were searched. The search was conducted from 06 to 20 January 2023 and 143 articles were found after applying the search method. From the previously selected articles, the following were removed: a) articles published before 2015, the year in which the 2030 Agenda was launched, b) articles in a language other than English. After applying these selection filters, a total of 28 articles were selected (Figure 1).

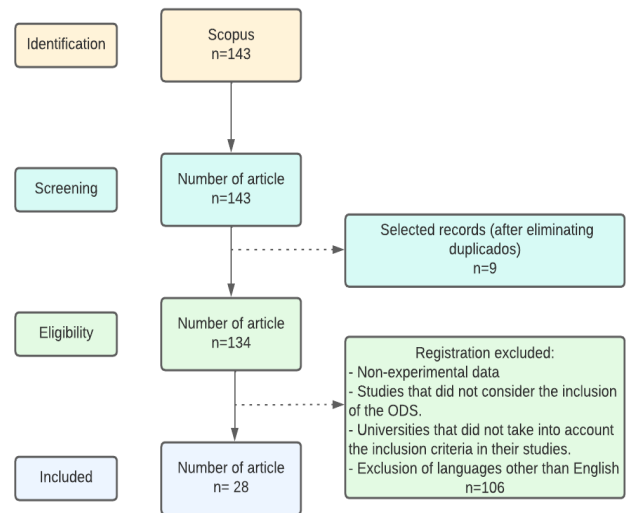


Figure 1. Multiple case study design

The selected articles were analysed independently. During this phase, each paper was analysed in order to construct the summary of variables contemplated in the research and to frame the objective of the review; and to identify the main ideas and highlight relevant parts of the texts, which made it possible to locate and interpret significant findings from the experiences of evaluating the implementation of the SDGs in higher education institutions at universities [30].

The Bibliometrix software [31] (cite here) was used to determine the scientific production by country and the VOSviewer software, a data mining tool widely used in systematic review studies and allowing visualisations of how a particular area of research has been developing [18] was used to analyse keywords, authors' networks and citations.

### 3. RESULTS

The results of this review are approached from a temporal and geographical perspective and are summarised in several graphs of relevant information, including years of publication, countries where the studies were conducted, keyword analysis, and network of authors.

#### 3.1 Analysis of scientific production

The evolution of the number of publications increased recently, with the highest number in 2022 reaching a total of 19 published articles, achieving a growth of more than 100% of publications in relation to previous years (Figure 2). In 2018 and 2019, only one article per year was reported, this number increased to three articles in 2020, two articles in 2021, 19 in 2022 and just two articles until 20 January 2023 (date of this systematic review), maintaining the trend of increasing annual publications.

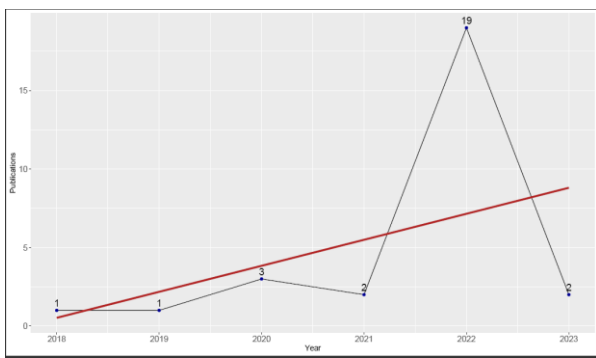


Figure 2. Publications by year

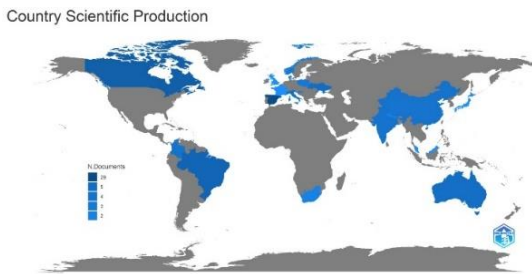


Figure 3. Countries of case studies

The analysis of the global scientific production on SDG implementation in higher education institutions showed that the continent with the highest number of publications on the topic of study was Europe, with 56% of the total number of manuscripts included in this review, with the Americas in second place with 24%, followed by Asia with 13% of research. Oceania participated with 5% of studies and Africa with 2% (Figure 3).

It is important to highlight that although in some research it was not possible to establish a single country of experience, Spain is the country that contributed the most scientific production (31%). Canada is in second place (12%), followed by Brazil (8%).

#### 3.2 Keyword analysis and journal co-citation

The co-citation analysis of 1008 journals shows that only 25 sources meet the criterion of being cited at least 5 times. Figure

4 shows five clusters, in which the blue (Sustainability) and green (International Journal of Sustainability) clusters stand out, with publication themes related to sustainability. The yellow group includes four journals, two of which publish on "education" (Studies in Higher Education and Education Economics). The fourth group (red) mainly includes journals that publish on environmental issues (Journal Clean Production, International Journal of Sustainable Development & World Ecology, Energies). In the group (purple) stands out Journal Clean Production, an international transdisciplinary journal that focuses on research and practice in cleaner production, environment and sustainability.

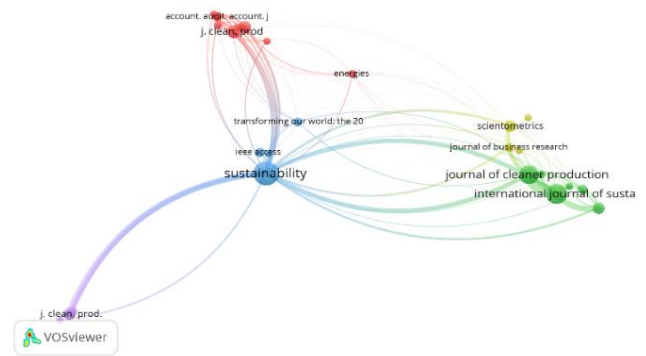


Figure 4. Co-citations network

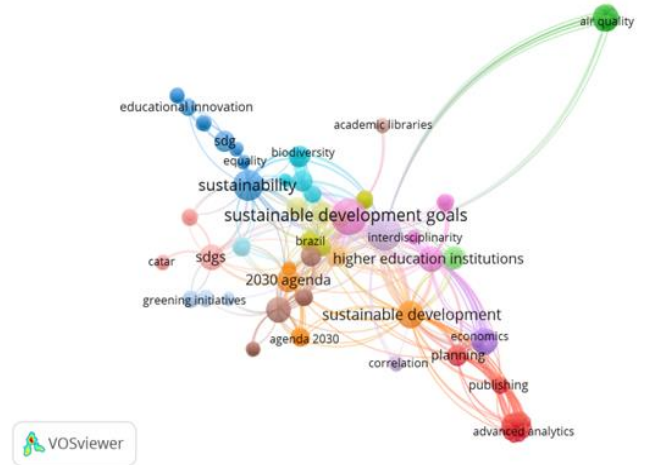


Figure 5. Keyword distribution by article

Figure 5 shows the 189 keywords of the analysed manuscripts. If we limit to three times in which a keyword appears, the result can be grouped into two groups, one group of words that relate to the sustainable development goals (sustainable development goals, sustainable development goal, sustainability, sustainable development, SDGs, 2030 agenda and SDG) and a second group in which education is highlighted (higher education institutions, environmental education, higher education, university sector and university).

Of the total number of studies analysed, 18 articles (64.3%) identified some actors that were considered in the research, being possible to identify students (17.9%), the academic community in general (28.6%), teachers and researchers (10.7%) and students and researchers as well as stakeholders and high-ranked university officials (3.6% each) (Table 1). In 10 studies (35.7%), no specific target audience was identified for the research.

**Table 1.** Public target delimited in studies

Reference	Target audience
[23, 32-35]	Students
[11, 36-45]	Not identified
[46-53]	The academic community at large
[11, 54-56]	Teachers and researchers
[57]	HEIs stakeholders and high-ranked university officials
[22]	Students and researchers

Table 2 summarises the main information from the search and presents in descending order the top 10 journals with the highest number of publications. Of the 28 manuscripts evaluated, it is evident that the journals with the highest number of publications are: Sustainability (Switzerland) with six (6) articles, International Journal of Sustainability in Higher Education with four (4) articles and Journal of Cleaner Production with two (2) articles.

When reviewing the quality of the publications measured by the impact factor, of the journals with the highest number of published articles, four of them (40%) belong to Quartile I (Q1), with the same number four journals are in Q2 (40%) and the remaining 20% are in Q3 and Q4.

It is important to highlight that the 10 journals analysed published a total of 19 of the articles analysed in this review, of which 9 were published in Q2 journals and 8 in Q1 journals. These data show that the main contributions to the SDGs are of interest to journals with a high impact factor and, in addition, their publication in different journals makes their behaviour comparable beyond the area of knowledge to which they belong.

In terms of the instruments used for data collection, the majority of the studies focused on the evaluation of scientific output (46.4%) generated by higher education institutions

(heis); 32.1% of the studies used surveys, interviews or questionnaires and the remaining 21.5% used mixed methods including both task reviews, sustainability reports, consultation forms and technological tools (Table 3).

Five studies (17.9%) emphasised some experience at the local level, i.e., they addressed the case of one specific institution per country; a total of 15 studies (53.6%) described experiences from more than one educational institution in the same country; and eight papers (28.5%) evaluated initiatives from different countries.

**Table 2.** Top ten journals with the highest number of articles

Number	Journal Name	Number of Articles	Cuartil (Q)
1	Sustainability (Switzerland)	6	Q2
2	International Journal of Sustainability in Higher Education	4	Q1
3	Journal of Cleaner Production	2	Q1
4	Applied Sciences (Switzerland)	1	Q2
5	Asia Pacific Education Review	1	Q2
6	Formacion Universitaria	1	Q3
7	Human Review International Humanities Review / Revista Internacional de Humanidades	1	Q4
8	Information (Switzerland)	1	Q2
9	International Journal of Management Education	1	Q1
10	Journal of Business Research	1	Q1
	<b>Total</b>	<b>19</b>	

**Table 3.** Location, year, data collection

Year	Country	Title	Data collection tools	Reference
2023	Australia	Embedding sustainable development goals (SDGs) in an undergraduate business capstone subject using an experiential learning approach: A qualitative analysis	Essays and interviews	[23]
2022	Spain	Responsible Graphic Design committed to Sustainable Development Goals	Documentation tasks and empathetic processes	[32]
2022	Italy	Sustainable development goals research in higher education institutions: An interdisciplinarity assessment through an entropy-based indicator	Interdisciplinary scientific production (articles, proceedings, books, book chapters, etc.)	[36]
2022	World Cup	Sustainable Development Goals in Higher Education Institutions: A systematic literature review	Scientific output in Scopus and Web of Science (WOS) databases	[18]
2022	Poland	The Involvement of Public Higher Education Institutions (HEIs) in Poland in the Promotion of the Sustainable Development Goals (SDGs) in the Age of social media	Scientific production (Number of publications promoting the SDG)	[38]
2022	EU countries	Quality of Education and Science in the Context of Sustainable Development Goals—From Millennium Goals to Agenda 2030: Factors of Innovation Activity and Socio-Economic Impact	Scientific production	[39]
2022	Italy	Reporting University Performance through the Sustainable Development Goals of the 2030 Agenda: Lessons Learned from Italian Case Study	Sustainability reports, surveys.	[52]
2022	Spain	A framework for implementing and reporting United Nations sustainable development goals in Spanish higher education institutions	Sustainability reports	[53]
2022	World	The Trends and Content of Research Related to the Sustainable Development Goals: A Systemic Review	Scientific production in Web of Science databases	[40]
2022	Australia	Assessing the United Nation's Sustainable Development Goals in academic libraries	Documentation tasks, analysis and empathy processes.	[46]

2022	Colombia	Aligning to the UN Sustainable Development Goals: Assessing Contributions of UBC Botanical Garden	Questionnaires, enquiry sheets and graphic sheets.	[47]
2022	Spain	Approach Developed According to Sustainable Development Goals and Challenges for Future Professionals in Social Intervention	Questionnaires	[33]
2022	Japan and Malaysia	A comparative study on turnaround leadership in higher education and the successful implementation of the UN's sustainable development goals	Scientific production in databases	[41]
2022	Spain	Toward a Faculty Aligned with the Sustainable Development Goals: Sustainability, Equality and Equity Action Plan (University of the Balearic Islands)	Scientific production	[48]
2022	India	A correlation study of sustainable development goal (SDG) interactions	Scientific production in Scopus databases	[42]
2022	World Cup	Sustainable development goals and capability-based higher education outcomes	Scientific production	[49]
2021	Spain	Internet of things (Iot) as sustainable development goals (sdg) enabling technology towards smart readiness indicators (sri) for university buildings	Technological tools, sensors, systems and networks.	[34]
2020	Denmark	Matching research publications to the united nations' sustainable development goals by multi-label-learning with hierarchical categories	Scientific production in databases	[43]
2020	Spain	Environmental education, an essential instrument to implement the sustainable development goals in the university context	Questionnaires, enquiry sheets and graphic sheets.	[35]
2020	Norway	Mapping scholarly publications related to the sustainable development goals: ¿Do independent bibliometric approaches get the same results?	Scientific production in Web of Science databases	[44]
2018	Spain	Implementing the sustainable development goals at university level	Scientific production in databases	[54]
2023	Australia	An overview of the engagement of higher education institutions in the implementation of the UN Sustainable Development Goals	Survey, questionnaire	[11]
2022	Spain	Educational and Multidisciplinary innovation for sustainability in the Ocean i3 project.		[50]
2022	Nepal	The state of the art in the incorporation of sustainable development goals in Nepalese Universities	Collection of field notes and observation	[57]
2022	Brazil	A Smart Campus Framework: Challenges and Opportunities for Education Based on the Sustainable Development Goals	Interview	[51]
2022	Hong Kong	An interpretive analysis of the 2030 Sustainable Development Goals in Hong Kong public universities	Survey	[22]
2022	Colombia	Integrating of sustainable development goals (SDG) for the fulfillment of the 2030 agenda in Colombian public universities	Questionnaire. Review of official documents, scientific and academic output.	[56]

#### 4. DISCUSSION

The case studies analysed show a significant increase in the number of publications that address the inclusion of the SDGs in higher education institutions; this indicates that there is greater interest among authors to develop new reflections on the topic and to assess experiences of implementing the SDGs in higher education institutions [18]. The increase in the scientific literature on the SDGs and their impact on higher education can be explained by the growing interest in the scientific community in environmental issues [58] and the responsibility to develop future leaders of sustainable development. By integrating the SDGs into curricula, they can provide students with the knowledge and skills needed to address them [21]. Therefore, all university higher education institutions should make great efforts by developing SDG-based management [59].

The selection of studies identified 28 studies. While it is true that most of these studies used scientific production as an indicator of compliance, 32.1% of them used surveys, interviews or questionnaires, which is a significant percentage and could bias the knowledge of actors on the SDGs in

universities. Along these lines, Torres and Isabel [60] indicates that the use of surveys is insufficient to observe the development of integration in curricula, curriculum redesign and the incorporation of the SDGs into curricula.

The results show that the European continent (56%) and specifically Spain (31%) lead in contributing to the production of case studies of SDG implementation in universities; however, developing countries in South America such as Brazil (8%) and Colombia (4.21%) feature in the selected studies, demonstrating that universities are operating in an increasingly globalised environment, constantly evolving, with new societal demands and where sustainability plays a crucial role [61]. It is therefore not surprising that universities worldwide are reorganising themselves to address the complex challenges of sustainable development [62].

Regarding scientific publications per year, an accelerated growth in the number of publications was observed, from one manuscript for the period 2018 - 2019 to 19 by 2022, representing a growth of more than 100% [18] considers that a greater number of experiences have been initiated due to the popularisation of the subject, the publication of guides and documents that emphasise the need for universities to adhere

to and implement the SDGs.

The data collection tools of the analysed manuscripts were: scientific production, task review, sustainability reports, enquiry sheets and technological tools; consequently, the sustainability assessments focused on a self-diagnostic process [56]. In this regard, the fact that each university institution knows the magnitude of its contribution (diagnosis) allows for the subsequent implementation of improvement actions in search of greater knowledge, awareness and intentionality about the SDGs [56, 63, 64].

## 5. CONCLUSIONS

This systematic review provides an overview of studies, methods and techniques used by higher education institutions to measure the level of integration of university education in relation to the SDGs. The findings show that higher education institutions are concerned with measuring the degree of alignment of their activities with the SDGs, as evidenced by the increase in publications in 2022 (19 publications) compared to 2018 (1 publication). The journals with the highest number of publications are *Sustainability* (six), with an impact factor of 7.246, a *CiteScore* of 5.0, an H-index 109 and Q2 ranking. Followed by *International Journal of Sustainability in Higher Education* (four manuscripts) it has an impact factor of 7.246, a *CiteScore* of 5.9, an H-index 66 and ranking Q2. Furthermore, 56% of publications were found to be from European countries, most notably Spain (31%), but there is little scientific production from developing countries, suggesting that in order to accelerate the implementation of the SDGs in higher education institutions, there is a need for more synergies in research and knowledge transfer between developed and developing countries. Finally, the studies used quantitative, qualitative approaches and mainly employed analysis of normative, academic and scientific documents, and with regard to data collection technique; they applied questionnaires, interviews and workshops.

## ACKNOWLEDGMENT

The researchers would like to thank the Universidad Nacional de Jaén, Data Science Research Institute, for facilitating the process of conducting this research.

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