Review

Sustainable University: From the Worldwide Conception to the Brazilian Amazonia

Jacqueline Bailão da Silva Lopes * and Thiago Almeida Vieira *

Doctoral Program in Society, Nature and Development (PPGSND), Institute of Biodiversity and Forests, Federal University of Western Pará, Santarém 68040-255, Brazil
* Correspondence: jacqueline.lopes@ufopa.edu.br (J.B.d.S.L.); thiago.vieira@ufopa.edu.br (T.A.V.)

Abstract: Higher Education as a transforming instrument in societies raises the need for universities and Higher Education Institutions (HEIs) as a whole to be leaders in the current paradigm of the time. The objectives of this study are to verify and analyze the movement and actions around the world that drove and started the conceptual model of Sustainable University (SU), as well as these ideas that started in Brazil and their implications for the reality of the Brazilian Amazon Region. A timeline has been sketched and provides additional theoretical insights into universities' involvement in events before and after the sustainable development process. The methodological procedures were based on a wide literature review in scientific databases that gather journals with satisfactory impact factors; with the refinement of the searches, 87 scientific articles supported the analysis of this study. The results show that universities have played a prominent role on the world stage since 1950, in the post-war period. In the 1970s, HEIs sought to engage in the design of the new paradigm, and in the 1980s it is enunciated as Sustainable Development and conceptualized by the Sustainability approach. Universities, which had been active in discussions and events related to sustainability from the late 1980s onwards, began to organize themselves more effectively and promote sustainable initiatives to become examples of sustainability. Currently, many HEIs from countries in Europe and North America stand out in the initiatives. In Brazil, according to a global classifier, some HEIs seek to align themselves towards the SU model. Until 2019, no university in the Brazilian Amazon region had integrated the ranking, but in 2020, two appear in the list. It appears that information on the sustainability of universities inserted in the context of the Brazilian Amazon is still incipient.

Keywords: sustainable campus; sustainable higher education; university in the Amazonia

1. Introduction

The concern with negative environmental impacts arising from the high consumption of natural resources prompted changes to the most diverse activities, products, processes, and organizations such as universities. These institutions are urbanized and autonomous spaces endowed with basic infrastructure networks and interactive flows between the academic community and society in general [1–4].

The Campus or Sustainable University (SU) refers to higher education institutions (HEI) that should break away from traditional models that still prevail to become a leader in sustainability and guide new directions [5–7], act to reduce the negative effects of its operation, exercise its role of Teaching, Research, and Extension, and encourage more sustainable lifestyles. Thus, it is the SU model for the transition to more sustainable habits, marked by not only ecological but also social, economic, and political dimensions [8–12].

In 1990, an international movement proposed, through integration networks between sustainable universities, the formalization of commitments and goals so that universities could boost the dissemination of sustainable campuses (in Europe the concept was of Eco campus) [13].

In Brazil, isolated actions by some universities have been identified since 2002 and the trend is to expand since the Brazilian government in 2002 started to determine the creation

of Sustainable Logistics Management Plans—SLMP in the Federal Public Administration. This normative requirement includes all federal Higher Education Institutions (HEI) in the country, so that they start or make their actions more sustainable [14].

The SU theme has stimulated actions, debates, and scientific investigations in several regions, mainly in countries in Europe and North America. Thus, this study seeks to connect the relevant events that led to the emergence of the SU and its consequences in the context of the Brazilian Amazonia.

Therefore, the objectives of this study are to verify and analyze the movement and actions that initiated and propelled the conceptual model of SU around the world, as well as the most important events and practices in this process and how these ideas were expanded by the HEIs of Brazilian Amazonia region. For this, searches were carried out in the databases of national and international scientific publications, university entities, and other related institutions. This was followed by the analysis of the contents reported that corroborated, over seven decades, the leading role of universities in sustainable development, while at the same time they need to consolidate themselves as a model for current societies.

This article comprises Section 2 with the temporal sequence of the main events that evidence the involvement of universities in the historical episodes of sustainable development, serving as a theoretical complement to the following sections. Section 3 contains a description of the materials and methods used in this study. Section 4 aggregates the results organized into four sequential topics that discuss: (i) University in sustainable development (in sustainability), exposing the role of universities in the unfolding of a new university standard; (ii) outlining the university for sustainability that deals with the conceptual construction for SU; (iii) sustainability in universities around the world; (iv) Brazilian universities and sustainability: a look at the Amazon region. Section 5 closes this study with the conclusions.

2. Universities in the Historical Episodes of Sustainable Development

2.1. Data Collection and Organization of Information

Verifying the involvement of universities throughout the events that preceded the conception of the sustainable development (SD) paradigm, until recently, motivated the construction of a timeline that avoided the simplification of these events [15], thus, relevant milestones were researched and extracted from the online domains of international entities and institutions that play a political and educational and scientific role in the global environmental issue and in the contexts in which committed HEIs are inserted.

The historical retrieval, which we call the timeline here, provides an additional basis for academic analysis, as reported by Larsen and Harrington Jr. [16], and here followed the phases of source selection, identification and categorization of data, and the periodization of events.

In the selection of sources, two basic institutions were defined to search for records: the first being that of the United Nations (UN) [17] with extension to its specialized agency the United Nations Educational, Scientific and Cultural Organization (UNESCO) [18] and the Environment Program (UNEP) [19]; the second institution is by the International Association of Universities (IAU), which is a UNESCO world organization concerned with the role of higher education worldwide, "the global voice of higher education" [20], which has specialized data portals and is interconnected to the other sources of partner entities, which allowed to further enrich the citations and discussion in this section.

Then, an extensive search was carried out in the databases of these institutions, with access to standards, legislation, technical publications, news, maps, etc. It was possible to access many original documents from the events that were digitized and are displayed in these publicly accessible domains. These collections are a rich source of data and information on past and current initiatives involving HEIs and DS. Therefore, we limited our research to identify events categorized as meetings, conferences, gatherings, agreements/statements, technical-scientific publications, formation of entities, and networks

between HEIs, meaning events in which the involvement of universities in sustainability issues is clear. For the period, whatever the date of these events until the year 2020 was considered.

Timeline periodization was subsidized by the use of Microsoft Excel 365 software and the free extension developed by Vertex42 for creating vertical timelines that apply the technique of an XY scatter plot, data labels, and error bars for the lines call [21].

2.2. Timeline of Universities towards the Sustainable Development Paradigm

The timeline is drawn from 1950 to 2020 (Figure 1), with a report below of the main episodes that involved universities and the debate on environmental issues in the world. This survey relates 47 events of notorious repercussion and relevance involving universities and the DS, with the events of the last year marked by the COVID-19 pandemic.

Thus, in the middle of the last century, in 1945, the effects of the Second World War led 51 countries to organize themselves to reestablish their nations with cooperation to ensure peace and face the challenges and ills generated, creating the United Nations (UN), and within its scope, the United Nations Educational, Scientific and Cultural Organization (UNESCO) to facilitate intellectual cooperation with the objective of promoting the development of UN member countries [22].

Five years later, in 1950, UNESCO brought together the HEIs and created the International Association of Universities (IAU) to drive global development and act in the advancement of societies in these countries. Currently, the IAU is composed of HEI leaders in more than 130 countries [23].

In the decade following the creation of the IAU, a movement began paying attention to the effects of human activity on nature, so in 1962, Rachel Carson's book Silent Spring was released, and by the end of the decade in 1968, the Club of Rome was formed.

In the book Silent Spring, the author, biologist, and scientist drew attention to the negative effects of synthetic pesticides on animal species, and her other studies have raised questions about the productive mode of the time, starting a discussion that intensified in consecutive decades and a new paradigm began to be visualized [24].

The formation of the Club of Rome in 1968 allowed the participation of world personalities who gathered to debate politics, economy, and the environment, but it was in 1972 that the group became better known, when it launched the Limits to Growth report, a document prepared with the support of a team of researchers from the university of Massachusetts Institute of Technology (MIT) who specified problems in current development.

The year 1972 was also marked by the UN conference in Stockholm (Sweden), with the Stockholm Declaration as an important result, in the form of a manifesto with principles to be followed by countries in the use of their resources. At the end of that year, the UN launched the United Nations Environment Program (UNEP), defining actions for the preservation and conservation of the environment [25].
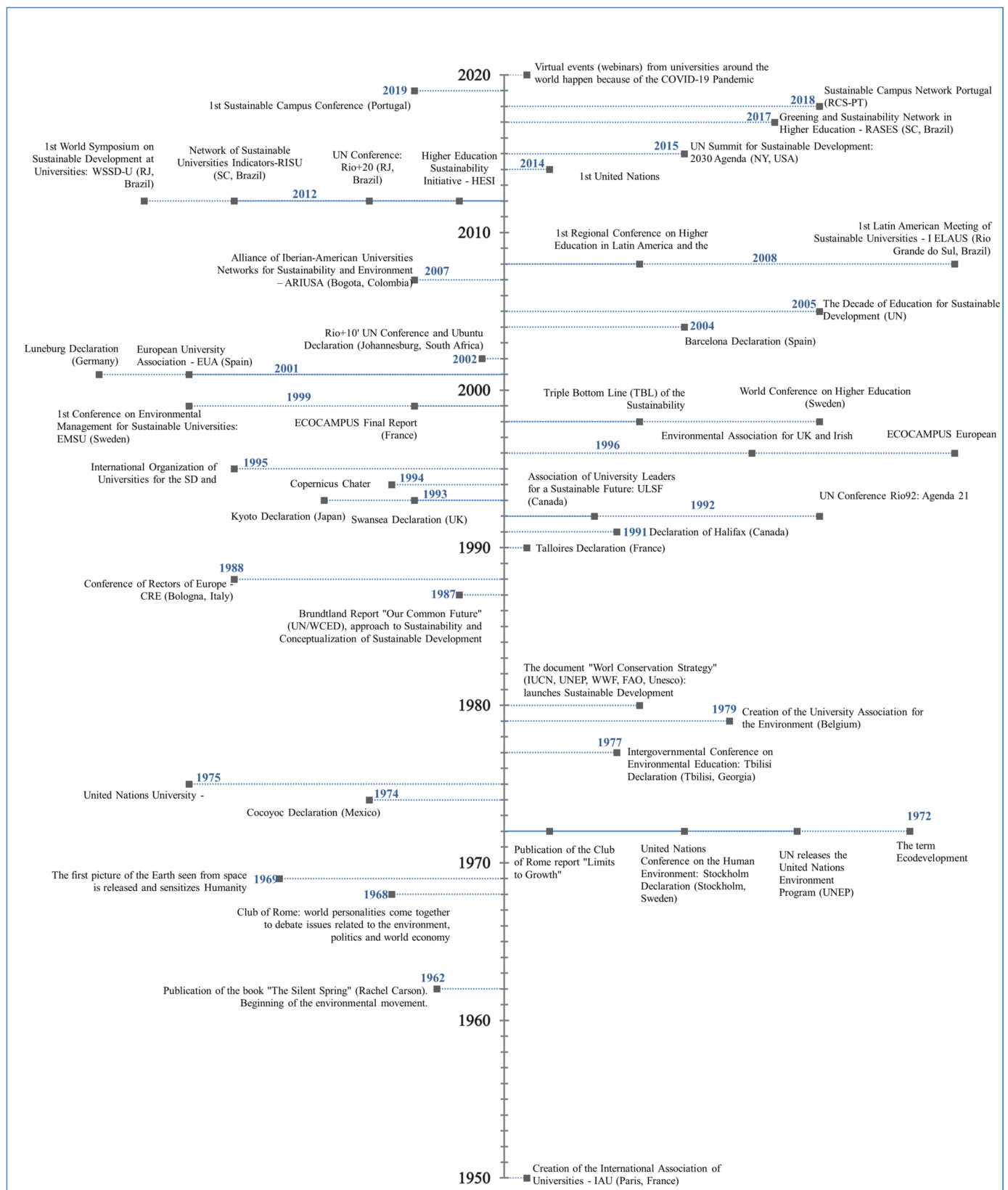
Figure 1. Timeline with events that mark the role of universities in the sustainable development paradigm. Elaborated by the authors. Sources: [23–65].

In 1972, the idea of "ecodevelopment" emerged, the term attributed to Maurice Strong, then UN Secretary-General, who referred to development in countries called "third world"

as the one whose style of production was more integrated into the ecosystem, and that the relationship of economic use and exploitation of natural resources did not reach the level of depletion perceived in countries considered to be "developed" [26]; therefore, criticisms about the development model of the time were reinforced.

Thus, in 1974 in Mexico, the Cocoyoc Declaration was launched at the UN Conference on Trade and Development, where the exploitation of global economic and social inequalities, environmental degradation, and the need for reorientation of the type of development was mentioned [27]. This declaration also makes explicit the call to universities to assist in this reorientation, which through science and technology would promote alternatives in the use of resources. The fundamental role of education in this change was highlighted [28].

Therefore, environmental illiteracy, as has been pointed out since then, led UNESCO to organize in 1977 the first World Conference on Environmental Education, which discussed strategies to guide societies to understand and face the effects of environmental degradation. The principles and agreements of this conference established that member countries support universities to act in interdisciplinary teaching and research with environmental issues, as well as making these institutions centers of excellence in the study and resolution of environmental problems and thus act as a bridge to other sectors of society, including business, in the sense of extension actions to promote the exchange of technology and technical-scientific and general knowledge [29].

In 1980 at the initiative of the International Union for the Conservation of Nature and Natural Resources (IUCN) under the UNEP, with the World Wildlife Fund (WWF), the Food and Agriculture Organization of the United Nations (FAO), and the UNESCO, the World Conservation Strategy document was launched that quotes the term SD and proposes actions and priorities for achieving it, discussing the need to combine conservation with development [30].

Environmental discussions advance, and in 1983, the physician and researcher Gro Harlem Brundtland chairs the World Commission on Environment and Development and leads a team for the study and publication in 1987 of the report Our Common Future. In this document, the concept of SD is launched for societies, supported by a state called aspiring sustainability, which would become the development model of post-modern societies [31].

The involvement of academia in global issues intensified, and in 1988 the Conference of Rectors of Europe (CRE) is held, an association of European universities with 326 representatives, where the University Magna Carta was signed and launched, which confirmed the desire for the autonomy of Europeans universities and the commitment to internationalization and acting in society as a cultural transformer and propagator of knowledge [32].

Thus, the commitment of these European universities in promoting the new development paradigm put them in a leading role in the following years. The events between its representatives brought signed performance commitments and added other universities from other continents. The 1990s were marked by intense activities in this regard, among several worlds HEI.

In 1992, the Association of University Leaders for a Sustainable Future (ULSF) appears in France [33]; in 1995, the European Ecocampus Collaboration was initially discussed, formalized in 1996 through the THERMIE program, which financed researchers in favor of rational practices in the use of energy and water [34]. In 1995, in Costa Rica, the International Organization of Universities for Sustainable Development (OIUDSMA) was created [35]. The Environmental Association for Universities of the United Kingdom and Ireland (EAUC) was formed in 1996 [36].

It is worth mentioning that, in 1992, the holding of the United Nations Conference on Environment and Development in 1992, the Rio 92, and the Earth Summit, which, in addition to the Rio Declaration, resulted in the formulation and launch of Agenda 21 as a document guiding SD and teaching as an essential tool for such a model [37].

Among the main documents formulated in the 1990s and which confirmed the performance of HEI in favor of sustainable practices and actions are listed: the Talloires

Declaration in 1990 [31]; the Halifax Declaration in 1991 [39]; the 1992 Rio Declaration on Environment and Development [37] as it is called the Swansea Declaration in 1993 [40]; the Kyoto Declaration in 1993 [41]; the University Charter for Sustainable Development and the COPERNICUS Campus project with 10 principles of action [42] and the Barbados Declaration [43], both in 1994; in 1995, the Declaration of Commitments of Iberian-American Universities for Sustainable Development; in 1997, the Declaration of Thessaloniki [44]; and the World Declaration on Higher Education for the 21st Century in 1998 [45].

As seen, the concept of SD was launched in the last decade, but in 1998, researcher John Elkington brings the concept of the Triple Bottom Line (TBL), which analyzes sustainability under three dimensions, social, economic, and environmental [46], later becoming a conceptual model on the rise in the public and private sector as it makes the definition of SD more understandable and becomes widely applied through the terminology of Sustainability [47].

1998 ends with the holding of the World Conference on Higher Education and in this event the partner universities defined, via the World Declaration, what they aspired to for higher education in the 21st century, envisioning the role of universities in the next century, considered the century of Information Society, as the information sector, in addition to providing advancement to other segments, should also drive the expansion of higher education [45].

In 1999, the collaboration of 14 universities from 7 European countries (Denmark, Finland, France, Greece, Poland, Portugal, and Romania) launched the Ecocampus project report, which specified elements necessary for the conception of a University or Sustainable Campus, with experiences focused on energy efficiency and water use [34,48]. The same year also held the 1st Environmental Management Conference for SU, EMSU 99—Environmental Management for Sustainable Universities [49].

The 2000s marked the continuity and expansion of the universities' activities. In March 2001, the European University Association (EUA) was created in Spain as a result of the merger of the association of European universities, Ecocampus, and the confederation of Conferences of Rectors of the European Union (CRE). Currently, the EUA supports 850 higher education institutions in 48 countries in the construction of European higher education [50].

Months later, in October 2001, a conference was held in Germany between university associations entitled COPERNICUS "Higher Education for Sustainability—Toward the World Summit on Sustainable Development (Rio+10)", to strengthen the global partnership between more than 1000 universities, where they drafted the Luneburg Declaration [51]. This document highlighted the importance of Higher Education for Sustainability and called on the UN to include and reinforce education in all debates at the world conference (Rio+10) to be held the following year.

Thus, in 2002, in the city of Johannesburg (South Africa), the United Nations Conference on Sustainable Development (Rio+10) sought to outline concrete goals and actions for the implementation of Agenda 21, which resulted in the Johannesburg Declaration on SD, the Implementation plan and promulgation of the Ubuntu Declaration [52].

The Johannesburg Declaration proposed to increase the capacity between science and technology to promote SD; to encourage the involvement and creation of networks between universities, scientists, researchers, and other sectors of society, avoid financial restrictions on HEI, and favor the exchange of academics from HEI located in developing countries. The Ubuntu Declaration registered the commitment of HEI to integrate SD into curricula at all levels of higher education and in scientific activities. Furthermore, the Implementation Plan defined, within three years, the creation of the United Nations Decade of Education for Sustainable Development (2005–2014), with education as the main element to achieve this goal [53].

At this pace, the universities launched in 2004, at the 2nd International Conference on Engineering Education for Sustainable Development (EESD2), the Barcelona Declaration that brought recommendations for the performance of HEI in the Decade of Education

that was to come. The directions were to work the courses, especially engineering, in a holistic, systemic, and integrated way to identify and act on society's problems, in addition to seeking reorientation to change the traditional model of teaching and research, a redefinition of the status quo [54].

Three years later, in Colombia, the Alliance of the Iberian-American University Network for Sustainability and the Environment (ARIUSA) was formed, an important academic network in strengthening the integration and exchange of knowledge between Latin American and Spanish HEIs [55].

In 2008, it was time for events to take place in South America, such as the 1st Regional Conference on Higher Education in Latin America and the Caribbean, the 1st CRES in Colombia and the 1st Latin American Meeting of Sustainable Universities, and the 1st ELAUS in Brazil. All of them involved HEIs from Latin American, Iberian, and Caribbean countries.

The 1st CRES was marked by the issuance of the Declaration of the Regional Conference on Higher Education in Latin America and the Caribbean that recognized the progress of their societies and pointed out the lack of deep changes in the SD of their regions, indicating education as a key factor for this, in particular higher education [56].

The 1st ELAUS was conducted in partnership with the following institutions: the University of Passo Fundo, the National University of Cordoba, the University of São Paulo, and the Polytechnic University of Catalonia, and included universities from Brazil, Argentina, Mexico, Uruguay, Colombia, Chile, Spain, and other Iberian-American countries, whose purpose was to share practices and expose the challenges toward the model of a more sustainable universities [57].

From 2010 to the present, universities around the world are encouraged to form networks of knowledge and collaboration and increase the adoption of sustainable practices. In Brazil, recently, universities located in the south and southeast regions have been concerned with creating partnerships to overcome the challenges of raising Brazilian universities to a global level of sustainable universities, which is why the Network of University Indicators was created Sustainable (RISU) in 2012 as part of ARIUSA [58], as well as the Network for Greening and Sustainability in Higher Education (RASES) [59], both based in Santa Catarina.

Recently, in 2018, the first network named the Sustainable Campus Portugal Network (RCS-PT) emerged in Portugal, in its "Letter of Intent" encouraging sustainable planning and management activities on the campuses of Portuguese HEIs [60]. In 2019, the RCS-PT promoted the 1st Sustainable Campus Conference (Portugal) [61].

However, back in 2012, the United Nations Conference on Sustainable Development in Brazil, Rio+20, which recognized the role of universities for in SD and the need to define new development goals for the millennium, stands out the Future We Want report. Indeed, the UN released a declaration to university leaders to sign a commitment to adopt sustainable practices in their HEIs, such as teaching SD concepts, encouraging research on SD issues, green the campuses, support sustainability efforts in the communities in which they are located, and engage and share results through international structures (networks) [62].

Three years after Rio+20, the UN summit met and launched the 17 Sustainable Development Goals (SDG) and 169 associated goals to be achieved by 2030. The Call for Agenda 2030 for SD is an action plan focused on 5P macro elements (People, Planet, Prosperity, Peace, Partnership) [63].

Fast forward to 2020 was marked by the exceptional event of the COVID-19 Pandemic which led to the reorientation of events between universities, which were carried out through virtual platforms. For example, on August 31, 2020, the Copernicus Conference was held online, among other webinars, meetings, forums, etc. [23]. In 2020, the 2nd Sustainable Campus Network Conference—Portugal also took place. This virtual environment was the fundamental means for the continuity of actions and debates at HEI, a need anticipated in 1998 when discussions on the role of HEI for the century of the Information

Society were taking place. The pandemic made universities adapt to the continuity of their learning and operating activities online or virtually [64,65].

3. Materials and Methods

The literature review was carried out to extract the greatest amount of information relating the role of universities in the process of sustainable development and their incorporation of the concept of sustainability. For this, scientific databases, both national and international, were considered sources. Similar research that this study was based on were conducted from a systematic literature review in HEIs in Portuguese-speaking countries [66] around the world [67] and in sustainability [68] with a focus on scientific publications.

The search in the national scientific bases used the official domains of Science and Technology of the Brazilian government called Capes Theses and Dissertations Catalog [69] and the Brazilian Digital Library of Theses and Dissertations (BDTD), which brings together all the scientific production of public post-graduate programs in the country [70]. For the international search, the focus was on databases that bring together journals with relevant impact factors [66,68] in multidisciplinary and interdisciplinary areas, namely: SciELO, Science Direct, MDPI, Wiley Online Library and Web of Science. The SciELO and MDPI databases have easy and free access to the full scientific texts, the other databases allow researchers linked to registered research institutions to remotely access the full texts. Access to full scientific texts allowed a more satisfactory content analysis for this study.

The keywords used in the database queries applied terms associated with the central theme of the SU. Therefore, the keywords selected by the researchers in this study were entered using Boolean operators (AND and OR), they are "sustainable university"; "sustainable campus"; "green campus"; "campus sustainability"; "sustainable development"; "sustainability"; "sustainability in Higher Education Institutions"; "environmental practices". In addition, all the terms mentioned above were associated with the others: "Brazilian Amazon", "Amazon region", and "Amazon", with a focus on directing searches for scientific studies that supported the analysis for the context of the Amazon region. The initial language insertion criterion for the terms (keywords) prioritized English, later on, other languages were considered in the insertion of searches, such as Portuguese, Spanish, and even German (Figure 2).

For entry of searches, there was no limitation on the period of publications collected, being accepted the indicative period for the beginning of each database until the year 2020, which reported a total of 1432 papers.

The publications collected, depending on the database used, varied in quantities and periods, with many of them appearing in more than one database. Thus, 151 publications were selected and investigated in full, and the related ones make up the referential base of this study (Table 1).
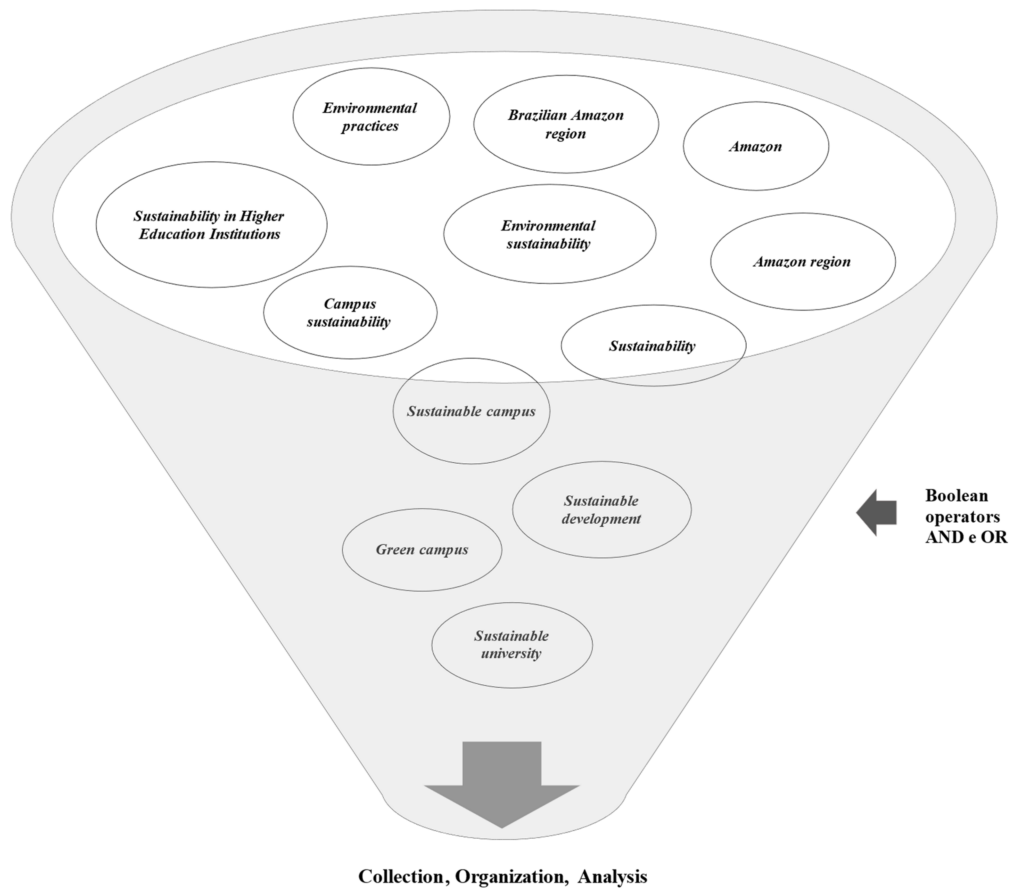
Figure 2. Terms searched in national and international scientific databases.

Table 1. Publications found in queries to scientific research databases.

Scientific Database Query			
Data Base	No. Reported Publications	Publication Period	No. Selected Publications
Capes Theses and Dissertations Catalog	14	2013–2019	10
Brazilian Digital Library of Theses and Dissertations (BDTD)	10	2012–2019	0
MDPI	243	1996–2020	23
SciELO	365	1997–2020	27
Science Direct	376	1996–2020	31
Wiley Online Library	289	1993–2020	22
Web of Science	135	1981–2020	38
Total	1432		151

Subsequently, the titles and abstracts of the publications reported were read to verify their usefulness in the composition of this study, as well as to exclude repeated articles. This refinement linked 87 articles with important historical reports, in addition to case studies and review articles. The articles were read in full, to collect information that showed the involvement and evolution of universities, in the world and Brazil, in the face of sustainable development (SD). It is noteworthy as a limitation of this methodology, possible misunderstandings by the researchers of this study that as pointed out by Lozano et al. [71] may occur due to the very nature of interpretation (hermeneutics).

Finally, the content of selected publications makes up the results in Section 4. Almost all subsection in Section 4 did not limit the period of selected publications, ranging from

1980 to 2020. The exception is in Section 4.3 which highlights "Sustainability in universities around the world" whose limitation of articles selected by the researchers adopted the time criterion for publication between 2015 and 2020, to avoid extensive repetition of content and favor updated information, thus, 23 papers support the analysis of this subsection.

4. Results and Discussion

4.1. The University in Sustainable Development (in Sustainability)

Universities, as shown by the previous timeline, over the last 70 years have been involved, directly and indirectly, in the processes of expressive changes in societies. At the same time that it stimulated the paradigm shift, it also became a part in need of transformation, needing to reinvent itself to fit into this complex SD process, and there is no time to pause.

In 1987, when the concept of SD was launched by the Brundtland Report [31], the team highlighted global issues such as social inequalities, economic crises, poverty, and the pollution and degradation of natural environments. The aspects of the time were unsustainable and far from the desired balance, therefore, uniting development with the environment raised the expectation of balancing economic, social, and ecological factors.

However, if at the beginning the barriers were linked to the lack of knowledge, assimilation, or rejection of the new paradigm, currently, with societies more aware of environmental issues, the problems turn to the need for SD implementation by the various sectors with a lack of actions concrete to environmental problems [72].

In the studies on the SD theme [73,74], which the authors verified, respectively, in 26 years (1991–2016) and 27 years (1993–2019) analyzed, there is a growing interest and diffusion of the subject and the important role of universities in this development. Countries in the United Kingdom, Australia, the USA, China, Germany, Sweden, Canada, Spain, Italy, and Finland are quite productive in studies related to SD, in whose theme, efforts are not exhausted to deepen and assess the directions of the SD.

The current world scenario still has many of the environmental problems that prevailed from previous decades, so the conceptual complexity of SD and its implementation, mentioned in the 1980s, continues to be addressed by several scholars, being a process with a global objective, the general commitment of institutions and people will set the pace and advances towards sustainability [75].

In fact, sustainability was a term used in the Brundtland Report, constantly related to SD by its authors, and its use was used in other areas to define whether a given element or object could be "maintained" or "sustained" [76]. Incorporated into the challenge of complexity that is SD itself, sustainability was also the term to which the practical scholar of environmental issues, Elkington, preferred to refer to through the model he called the Triple Bottom Line [46], whose objective would be to guarantee better and more satisfactory results for the three basic dimensions, economic, environmental, and social, referring to this as the challenge of Sustainability (Figure 3).

The Triple Bottom Line model of sustainability, then, became widespread in the corporatist, governmental, and academic world, being part of numerous research and impact assessments and environmental performance reports [77]. Nowadays, it has become a trend to explicitly include a fourth pillar in sustainability analysis, that of governance (Figure 4) [47,78,79].
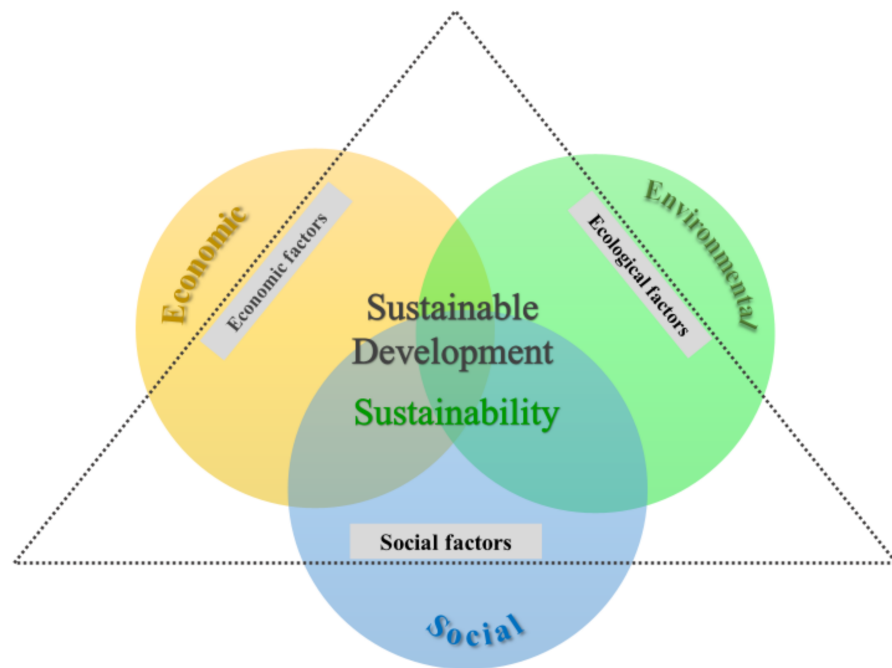
Figure 3. SD factors discussed in the Brandtland Report (1987) and the dimensions of Triple Bottom-Line (1998). Elaborated by the authors. Sources: [31,46].
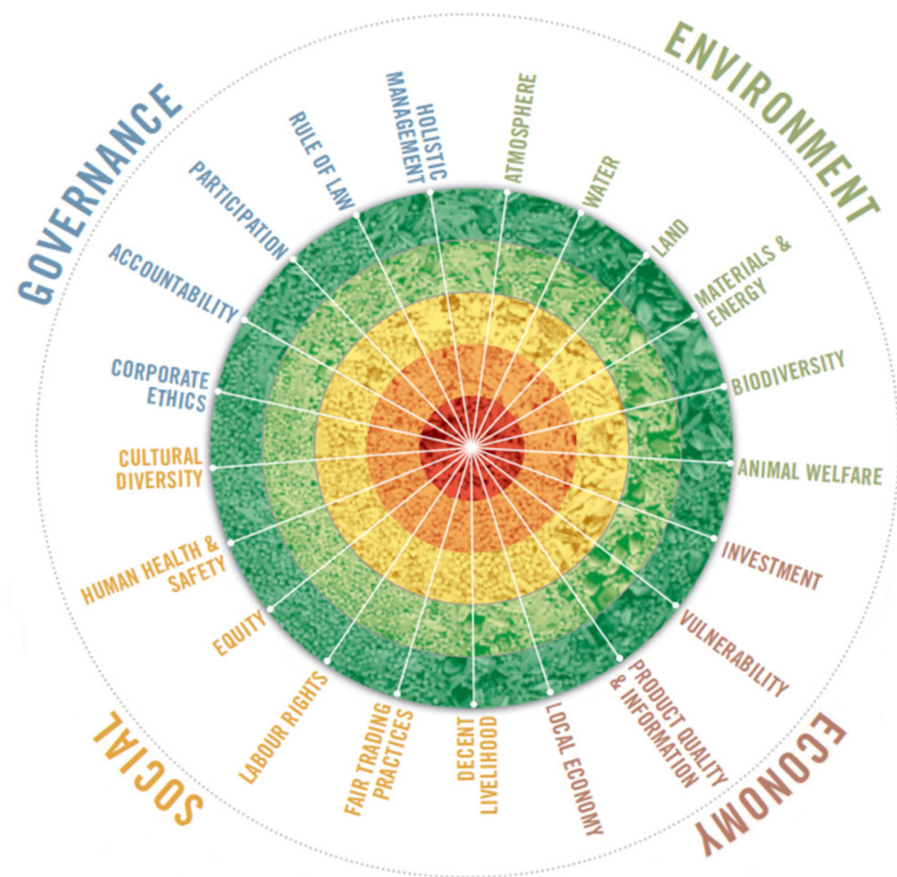

Figure 4. Governance as the fourth pillar for Sustainability. Source: [78].

Governance is a term not mentioned in the Brundtland Report (1987), although the document constantly highlights the role of governments and rulers for SD. At the Rio92 occasion, the term appears and remains from then on as an important concept stating that this, if positively developed, is essential for the SD process, representing not only the physical elements, but also the values of governments in being transparent and democratic, both at the micro and macro levels [37], an important element, even in sustainability studies in HEIs [80,81].

In the range of studies carried out so far [47,82], conceptual pluralities of understanding and interpretations about sustainability and SD are many, requiring, when appropriate, a consensus on the delimitation of terms because, in many situations, they are arbitrarily generated, not matching, in several cases presented, with the essence of these terms.

It is necessary to consider sustainability an integrative, dynamic, and systemic form and that the existing conceptual pluralities have brought to the term "sustainable" a kind of adjective or attribute ("sustainable X"), as would be the example for University or Campus "Sustainable", and the term Sustainability is substantial (essence) and the term SD is a process [47,74,83].

However, in all logical cases, these authors conclude that this vast conceptualization is intrinsic to the SD process and that Sustainability must be holistic, based on the context in question and on the possibility of immediate action to solve the specific problem. Therefore, it would not fit, in these contexts, to have a universal model that does not allow for specific variations and interpretations, as this would be decharacterizing the SD process, which is known to be, in essence, complex and systemic.

However, without a doubt, the terms "SD" and "sustainability" are therefore the most used and, in the last two decades, increased interest in the study of other segments that came to be described by the term environmental to incorporate old areas of the knowledge to the new paradigm, such as Environmental Policy and Economics [74].

In support of this systemic contextual view that increases Sustainability, the 17 SDGs come, then, to extend this fixation to the three dimensions commonly used in previous environmental studies, suggesting that other dimensions (Figure 5) should be integrated and indivisible in the in order to balance the macro-dimensions of sustainable development (Economic, Social, and Environmental) [63].

Figure 5. The 17 Goals of the United Nations Environmental Agenda for 2030. Source: [63].

To promote quantification of sustainability, Sustainability Indicators started to be extensively studied and explored from the 1990s onwards, with the expectation of measuring and informing the advances of SD and the level of sustainability to assess the distance from the proposed goals. Up to this day, this is a challenging but necessary task [74,84].

Thus, in the same way, that the SD is based on context, with its "meters", the opposite cannot happen. In fact, this must be the guiding principle in the construction of the indicators. Therefore, an essential step in structuring sustainability indicators is to collect real and contextual information, including sociobiological ones, with a conceptual design and verification of data available before collection and construction of these [80,84,85].

Finally, revisiting the previous conceptual terms, it will be noted the emergence of a recent conceptualization for an active segment in the history of sustainability, which are universities and HEIs in general. The intention of "greening" these institutions has been gaining strength since the 1970s (Stockholm Conference, 1972) and was strengthened after the definition of SD by the Brundtland Report in 1987 and in 1990 with the Talloires Declaration, as specified above, and that marked the intention of university leaders in the realization of the ideal of SD, through actions described in the document.

Therefore, it is possible to notice in the scientific databases consulted that from 1989 to 2000, scholars brought notes for the structuring of SU and made criticisms to better delineate it. A new conceptualization is added to universities to assume the role of a model in the SD, with this, it is possible to find in the literature of the last 25 years (1996–2020), terms such as Ecocampus and Green Campus, which were expanded to others, such as, Sustainable Campus, Green University, Green Campus, and Sustainable University. These nominations result from the process that these institutions have been going through, in a mutually active and passive condition, facing the sustainability paradigm.

The year 2005 marked the beginning of the Decade of Education for Sustainable Development launched by the UN and increased the number of scientific publications focused on the term SU. This aggregation of the adjective "sustainable" to the noun "university" denoted the conception of a quirky educational institution, impregnated with this attribute of great importance nowadays [86].

4.2. Outlining the University for Sustainability

In emergency matters, there seems to be a legitimate and tending need to act first and then conceptualize the objects. Thus, it was not different for the concept of SU, which at the beginning arose from a question about what higher education should be for SD and the role that universities would play in this process.

In this sense, important debates and university events that took place, such as the Conference of Rectors of Europe (Copernicus Program) in 1988, brought advances in studies on the subject, including those from the first decade of the 2000s, such as by Bosselmann [87], Cortese [88], Martin and Jucker [89], Lozano [5], Velasquez et al. [7], and Lukman and Glavic [8].

The authors [5,87–89] brought provocations that it was necessary to break with the traditional HEI model to achieve sustainability. Therefore, aspects that constitute the university and are intrinsically related, such as Education, Research, University Operations, and the External Community (Figure 6), could not tolerate isolation, a mono-disciplinary mode, and resistance to change [88]. In reinforcement, it is suggested the fifth aspect for the SU, that of evaluation and reporting for continuous improvement of its actions [5].

In the view of these authors, it is necessary to incorporate and institutionalize the "sustainable" in a dialogued, multi- and interdisciplinary, holistic, collaborative, and cooperative way in the daily lives of those involved. Make the university's agendas compatible with the SD, and make it assume the leadership role in this process.
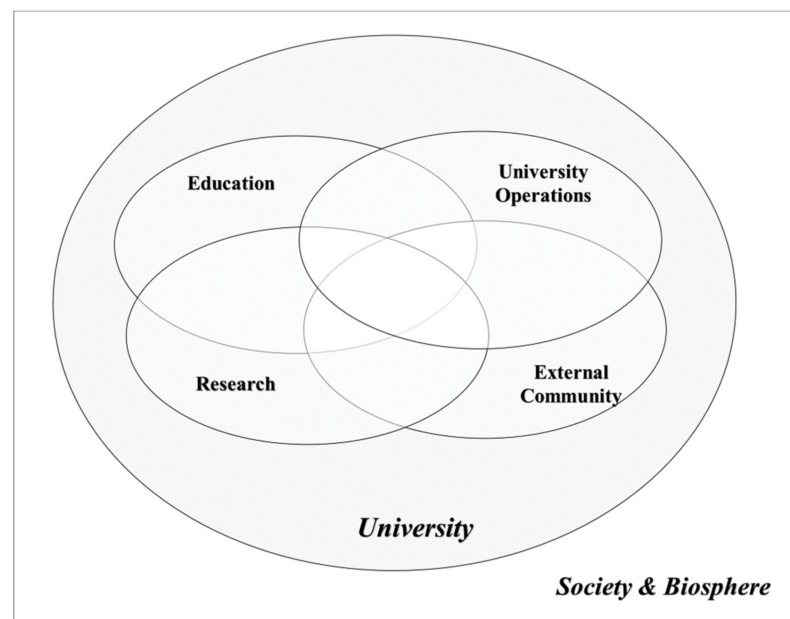
Figure 6. The university incorporated and integrated into Sustainable Development. Source: Adapted [88].

The university is an organization that should actively address five capitals in its management, in which it is dependent while contributing to them: (1) natural capital (environment); (2) human capital (people); (3) social capital (social relationships and structures); (4) manufactured capital (fixed assets); and (5) financial capital (profits, losses, revenues, etc.) [89].

Through the verification of initiatives in 40 universities around the world, [7] pointed out that for a university to be considered sustainable, four phases should be followed: (1) to determine a sustainability vision for the HEI; (2) outline an SU mission; (3) create a Sustainability Committee with a definition of policies, objectives, and goals; and (4) define sustainability strategies with initiatives in education, research, and fostering partnerships and actions for operational implementations on campuses. The importance of a collaborative network between sustainable universities is also reinforced.

Based on the mission defined in the universities studied by authors [7], they defined SU in the following terms:

> *Higher education institution, in whole or in part, that addresses, involves and promotes, at a regional or global level, the minimization of negative environmental, economic, social and health effects generated by the use of its resources to fulfill its teaching functions, research, outreach and partnership and management of ways to help society transition to sustainable lifestyles.*

([7], p. 812)

Therefore, there are the key elements of an SU, whose concept should encompass environmental protection, economic performance, and social cohesion, promoting research, technological development, and innovation in a knowledge-based society [8]. All this permeated in the spiral that proposes four major steps (Figure 7).

Figure 7. Spiral with the processes and key elements of a Sustainable University. Elaborated by the authors. Source: [8].

(1) Policy—definition of the mission, values, objectives, and goals established by SU and defined in a strategic plan;

(2) Operational—a set of actions involving the pillars of education (teaching), research, and practice, which can also be seen as the role of the University Extension and the administrative management sectors of the HEI, with all these elements in mutual involvement between the academic and external community;

(3) Assessment—the use of assessment and management instruments will be realized by the IES, supported by appropriate methods of data/information collection and indicators, to guarantee environmental performance (ecological, social, economic, governance) of the university;

(4) Optimization—through the analysis and evaluation preceded by the previous stage, as well as advances, obstacles, system improvements (innovations), and communication, transparency must be consolidated through a sustainability report that will support managers in decision making.

A survey about what SU would mean was conducted of Canadian university presidents who were signatories to the Talloires Declaration [90]. Among it is 21 participants, 2 claimed they had never heard the expression. Most related to physical aspects, such as rational technological implementations and environmental practices in their processes (green buildings, rational use of energy, water, soil, etc.), with no mention of actions via teaching programs as part of the concept. In short, the perception obtained from the rectors, according to this author, is that an SU is one that prioritizes the greening of its physical and financial structure, with the idea of achieving sustainability prioritizing these two areas.

The authors who reviewed the methods adopted by HEIs in search of the concept of the Sustainable University emphasized that sustainability in universities is not new [9], since the adoption of the International Organization for Standardization (ISO) of the Management System Standard Environmental (Audit, Environmental Performance Assessment, Environmental Labeling, and Life Cycle Analysis) and environmental certifications have been applied by HEIs. Furthermore, the authors cite the tools for evaluating and improving sustainability implementations in HEIs, such as evaluators, classifiers, and reports, which are based on indicators, generating indices, and sustainable levels. The concept of the SU also reinforced by the authors is based on the four pillars previously addressed [88].

In the research at a Colombian university, the concept of the SU was extended for an integral concept of a Sustainable Campus, including the economic, social, and environmental, integrated with cultural, political, and academic areas and university physics [91].

In Turkey, researchers sought to define SU based on what they called public opinion, based on the perception of data from intellectuals, specialists, political parties, media, and the public. The authors verified the various facets of the concept in each group and raised the assertion that the SU is a brand, with a unique identity, which, in addition to the physical-structural part, aligns theory and practice, focuses on curricula and awareness of its students and graduates, in order to expand sustainability on a regional scale [10].

The study about paths traced by leaders from 17 universities around the world (Australia, China, Canada, the United Kingdom, the United States, and Germany) showed who had been strongly committed to "Higher Education for SD". In these universities, the structural and management system to promote and lead SD includes four elements related to governance: values, strategy, partnership, and transparency [92].

As the authors point out, the university's strategic role in effecting changes towards sustainability has been recognized by several actors (students, professionals, and political representatives), however, many HEIs are late in performing this role or have sought inadequate ways to do so, because, as stated by the authors, creating an SU is not an event, but a process.

For this, the increasing focus on partnerships between external communities and universities reinforces the role of another pillar of HEIs, in addition to education and research, which is important to encourage changes and regional transformations, which is extension. In this sense, partnerships between community leaders and university students, professors, and employees favor the exchange of knowledge, experience, and resources that can benefit everyone [93].

In this sense, the researchers bring the definition of the Sustainable University of Excellence (SUE) as a university that mobilizes its human, intellectual, financial, and social capital to efficiently, effectively, ethically, and routinely create and disseminate knowledge that advances the progress of individuals, organizations, and societies towards a sustainable future. Therefore, when aiming for an SUE, the authors point out seven essential performance domains to be further explored: (1) Teaching quality; (2) Research culture; (3) Building technological capacity; (4) Accessibility; (5) Community involvement; (6) Internationalization; and (7) Environment [94].

Anyway, the need pointed out in the 1990s for HEIs to break with their traditional standards has provided advances. As noted, there are four stages of development of HEIs in view of the worldview: (a) HEI 1.0—traditional (focus: entry, authority, and hierarchy); (b) HEI 2.0—modern (focus: production, efficiency, and competition); (c) HEI 3.0—postmodern (focus: dialogue with stakeholders and students); (d) HEI 4.0—integrative (focus: systemic solutions, co-creativity, and sustainability) [95].

The University 4.0 concept is proposed as an organizational model suitable for dealing with the complexity and challenges of the SD since, in this model, the SD is not something to be dealt with, but a constitutive part of the HEI. In this model, another key point is that the digital age can drive the evolution of HEI by adopting digital, integrative, collective and systemic technological tools [95].

4.3. Sustainability in Universities around the World

Sustainable initiatives have been highlighted in several cases of universities around the world (Table 2) and that are realized in practice through academic actions of reaching, research, and extension with their inclusion in curriculum content and activities relating to external communities, as well as in the operational aspect (management and maintenance) of these institutions.

Table 2. Studies related to sustainable initiatives from universities around the world.

Year	Author	Title	Country	Research
2015	Zou et al. [96]	Comparing Sustainable Universities between the United States and China: Cases of Indiana University and Tsinghua University	USA and China	Comparison between two universities in China and the US on their organizational systems of sustainability practices.
2016	Sonetti, Lombardi and Cherlleri [97]	True Green and Sustainable University Campuses? Toward a Clusters Approach	Italy and Japan	Comparison between two universities, in Italy and Japan, on their ways of supporting sustainable development according to their contextual characteristics.
2016	Alshuwaikhat, Adenle and Saghir [98]	Sustainability Assessment of Higher Education Institutions in Saudi Arabia	Saudi Arabia	Assessment of sustainability practices in Saudi universities.
2017	Zettl, Lindenthal and Biedermann [99]	Environmental Management at Universities. Progress in the Cooperation Project of the Alliance of Sustainable Universities in Austria	Austria	Analysis of university sustainability strategies within the scope of the Alliance of Sustainable Universities.
2017	Golowko and Förster-Metz [100]	Sustainable Universities in German Speaking Countries—An Overview	German-speaking countries	Strategies of German-speaking universities in laying the foundations for sustainable development.
2017	Kwami et al. [101]	Sustainable Operation Practices: the case of Universiti Kebangsaan Malaysia	Malaysia	Assessment of sustainability operations at University Kebangsaan Malaysia (UKM).
2018	Bizerril [102]	Universities in Transition to Sustainability: Challenges and Opportunities for the Campus of the University of Brasilia in Planaltina	Brazil	Case study of a university in Brazil with the potential to be a reference in sustainability.
2018	Bizerril et al. [66]	Sustainability in higher education: A review of contributions from Portuguese Speaking Countries	Portuguese Language Countries	Sustainability in universities in Portuguese-speaking countries.
2018	Fichter and Tiemann [103]	Factors influencing university support for sustainable entrepreneurship: Insights from explorative case studies	USA and Germany	Comparison between two universities, in the US and in Germany, on projecting the appropriate sustainable university system.
2018	Oyama, Pasquier and Mojica [104]	Transition to Sustainability in Macro-Universities: The Experience of the National Autonomous University of Mexico (UNAM)	Mexico	Assessment of the challenges for a macro-university to incorporate sustainability as an integral dimension of its activities: National Autonomous University of Mexico (UNAM).
2019	Magoqwana [105]	"Putting Food back on the Table": Decolonising towards a Sustainable University that Feeds Us in South Africa.	South Africa	Analysis of higher education in South Africa towards a sustainable African university of the future.
2019	Moore and Iyer-Raniga [106]	Reflections of a green university building: from design to occupation	Australia	Verification of sustainable initiatives in Australian universities.
2020	Hasim et al. [107]	Factors influencing the adoption of sustainability into university facilities management practices: a case study of universities in South Australia	Australia	Factors that can improve sustainability practices at Australian universities.
2020	Ali and Anufriev [108]	UI GreenMetric and campus sustainability: a review of the role of African universities	Africa	Sustainable Strategies in African Universities.
2020	Lattu and Cai [109]	Tensions in the Sustainability of Higher Education—The Case of Finnish Universities	Finland	Understanding the tensions regarding sustainability in the context of the Finnish university system.
2020	Gholami et al. [110]	An ISM Approach for the Barrier Analysis inImplementing Green Campus Operations: TowardsHigher Education Sustainability	Malaysia	Analyzes barriers to implementing green campus operations in Universiti Teknologi Malaysia (UTM).

Table 2. *Cont.*

Year	Author	Title	Country	Research
2020	Niedlich et al. [81]	Cultures of sustainability governance in higher education institutions: A multi-case study of dimensions and implications	Germany	The governance based on cultural orientations of sustainability in eleven higher education institutions German.
2020	Amaral et al. [67]	A review of empirical data of sustainability initiatives in university campus operations	31 countries	Survey of sustainable initiatives in 106 HEI in 31 countries around the world.
2020	Șimon, Stoian and Gherheș [111]	The Concept of Sustainability in the Romanian Top Universities' Strategic Plans	Romania	Verification of sustainability in your strategic plans for Romanian universities.
2020	Leal filho et al. [112]	Sustainability Leadership in Higher Education Institutions: An Overview of Challenges	29 countries	Survey of the main characteristics of sustainability leaders in HEI and the main challenges.
2020	Șerban et al. [113]	Sustainable Universities, from indifference to joint action—A panel data analysis	Europe: 18 countries	Analysis of the level of sustainability in European universities.
2020	Sonetti, Barioglio and Campobenedetto [114]	Education for Sustainability in Practice: A Review of Current Strategies within Italian Universities	Italy	Analysis of the set of education strategies for sustainability in 18 Italian universities.
2020	Bucea-Manea-Țoniș et al. [11]	Sustainability in Higher Education: The Relationship between Work-Life Balance and XR E-Learning Facilities	Serbia, Romania, and Hungary	Investigate students' perception of how much work, study, and social life are influenced by virtual technologies.

In a comparative study between universities in China and the USA, it is sought to understand how these specific institutions, according to their political and cultural contexts, implement sustainability programs and practices [96], as well as between American universities in comparison with those in Germany in an attempt to understand the different contexts of both countries [103].

In American HEIs, the organizational system is less structured, but with specific and detailed sustainability strategies and goals. In this sense, indicators and the Sustainability Tracking, Assessment, and Rating System (STARS) were developed to assess the process and results of sustainability efforts at universities, which is now used by other HEIs in the SU. In China, the sustainability framework is more hierarchical and centralized, seeking greater effectiveness. While in the USA the involvement of volunteers is more pronounced, in China, there is greater involvement of environmental specialists in their sustainability activities [96].

Between the USA and Germany, university sustainability focuses on activities in support of sustainable technology transfer and cooperation with industrial sector partners, driven by market forces and private financing, which increases the motivation for external networks that favor access to resources. In Germany, the development of universities is strongly marked by public financial support, where sustainability is encouraged by government programs so that sustainability-oriented criteria are adopted so that the German government makes resources available to the HEIs most involved in these practices [104].

In an in-depth study of 40 German-speaking universities (20 in Germany, 11 in Austria, and 9 in Switzerland), it was found that they recognize the concept of sustainability, although implementation varies. Among the Austrian countries, from the initial stage, a complete picture includes the three pillars of sustainability. In Germany and Switzerland, in large part, sustainability is institutionalized, initially, by recommendations of general guidelines, and the implementation is due to the free intention and creativity of universities [100].

The study carried out in Austrian universities within the scope of the Alliance network (Alliance of Sustainable Universities in Austria), an integration of 15 HEIs that seeks to promote sustainability and contribute to a more sustainable society, shows that the measures adopted are centered on "laboratories throughout the real world", as small-scale

experimental environments, marked by co-production, transdisciplinarity, continuous methodological reflection, guidance, and monitoring [99].

A survey also analyzed two universities from different continents and contexts, Polito in Italy and Hokudai in Japan [97], using sustainability indicators from the GreenMetric metric model [115], and the Japanese university was 71 positions ahead of the Italian.

At the University of Osaka in Japan, a study showed strategies used to contribute to the transformation of this into an SU, with actions aimed at a more energy-efficient technologies, enabling the achievement of goals to reduce the consumption of natural and financial resources [116].

In 2020, a survey of 18 Italian universities researched the sustainability actions related to the SDGs and was carried out and disseminated between 2016 and 2019. In these HEIs, teaching is the engine of educational sustainability initiatives, whose theme is included in the existing curricula. Therefore, two-thirds of the initiatives are in the teaching area, followed by extension activities that seek to generate knowledge beyond the academic sphere and with a focus on regional socioeconomic development. Fewer initiatives are perceived in other areas of the university, 13% of them in operational aspects (physical-administrative and structural) and 5% in research activities [114].

An analysis published in 2020 carried out in 58 universities in Europe sought to analyze the sustainability of these by the GreenMetric model, according to indicators of the following criteria: water, transport, infrastructure, education and research, and energy; the results showed a high level of sustainability in these HEIs [113]. Universities in Europe show themselves to be at the forefront of the concept of sustainability for higher education, and the authors reinforced that their work with local and government authorities is important for the SU meaning.

Therefore, outlining the tensions for HEIs capable of change is inevitable, making it essential to manage the conflicts that arise to continue to advance. This issue of tensions in the context of the Finnish university system was also addressed, highlighting the six tensions related to social, economic, and environmental factors, which are (1) academic leadership and management; (2) regional political tensions and university profile; (3) political power over the university system; (4) performance of academic and professional work; (5) academic autonomy and the role of the State; and (6) future role of the university institution. Overcoming these barriers and tensions becomes imperative on the path to sustainability [109].

A similar fact verified in Finland also refers to universities in Romania. In the 12 Romanian universities classified by their government as "advanced", scholars have pointed out that, although the country is part of Europe and there are several HEIs in the world attentive to promoting the concept of sustainability, Romanian universities do not have a central concern to build an SU and use the term sustainability for several other domains, such as finance, economics, and health, but in isolation [111].

In Saudi Arabia, practices do not occur satisfactorily and HEIs are less committed, as less than half of them incorporated questions and challenges in favor of SD in their teaching [98]. At a Malaysian university, data show a low to medium level of sustainable practices, marking a large carbon footprint in these HEIs [101].

In Australia, there is a concern with sustainable university initiatives, which is why a group of five universities known as the Australian Technology Network has set a 25% reduction target in greenhouse gas (GHG) emissions from 2007 to 2020. The changes for this new conception of HEIs should involve practices in teaching, learning, and research [106].

Therefore, in Australia, the following factors can improve sustainable practices: performance of stakeholders (students, faculty, and staff), economic benefit (cost reduction), the commitment by senior management and collaboration with other parties (local government, state government, or private companies) [107].

On the other hand, in Africa, the universities on that continent have been timidly concerned with adopting sustainable practices, despite 18 of them have been signatories to the Talloires Declaration (1990) [108]. In short, African HEIs do not lead and do not appear

expressively in ranking lists, such as GreenMetric, and also do not stand out in the list of research and initiatives in the area. In addition, other authors raise the issue that South Africa, for example, must prioritize social/economic inequalities and the reduction of hunger and poverty as central issues to begin transforming university spaces and making them adopt strategies sustainably [105]. According to the authors, universities in Africa are exclusive and elite, being at an early stage toward sustainability [108].

In Mexico, the National Autonomous University of Mexico (UNAM) plays an important role in the SD of this region and has a great influence on countries in Central and Latin America; however, its rise to world university leadership in sustainable issues has not been established. Many initiatives remain isolated and make it difficult to incorporate and consolidate sustainability as a central dimension of activities [104].

The theme of SU was analyzed in Portuguese-speaking countries (Angola, Brazil, Cape Verde, Guinea-Bissau, Mozambique, Portugal, São Tomé and Príncipe, East Timor, and Equatorial Guinea), which fund important initiatives in the areas of education and research that emphasize in decision making for a more democratic management and the participation of different stakeholders [66]. In the operational aspect, the HEIs in Portugal explain better results. The authors also draw attention to the few partnerships between universities in Portuguese-speaking countries, although in countries such as Brazil and Portugal, internal connections (networks) are gaining strength.

Worldwide, actions were investigated actions sustainable in 106 HEIs of the 31 countries with main activities in the areas of energy, buildings, water, waste, transport, soil, air and climate, and food, with a greater promotion of operational actions [67]. In higher-income countries, there is an investment in more efficient systems, with North America and Europe being the regions with the highest number of institutions that are better positioned in sustainability classifiers (rankings). However, the authors draw attention to the varied results between universities, suggested by the specificities of each campus, culture, climate, or policy.

In terms of university management, it was sought a global understanding that governs sustainability in HEIs; for this, it consulted 50 leaders from 29 countries [112]. These managers' considerations of the leadership role that can drive the transition of HEIs to sustainability requires the ability to innovate, think long-term, and manage complexity. Most of them, that is, 78%, indicated the need for greater investment in education and 76% for curriculum change as the main actions for sustainability.

4.4. Brazilian Universities and Sustainability: A Look at the Amazonian Region

In Brazil, initiatives were reported from 2002 by the Regional University of Blumenau (FURB), the University of Vale do Rio dos Sinos (UNISINOS), the Federal University of Santa Catarina (UFSC), and the Federal University of Rio Grande do South (UFRGS) when they started to implement their Environmental Management System [117]. Subsequently, there have also been initiatives from the Federal University of São Carlos (UFSCar), the State University of Campinas (UNICAMP), and the University of Passo Fundo (UPF) [118].

In an effort to follow the global trend in 2012, Brazil launched a legislative and normative reinforcement within the scope of the Federal Public Administration to direct, autarchic, foundational, and state-owned companies, including federal HEIs. Thus, Decree No. 7746/2012 was launched, which started to regulate sustainable criteria and practices in the Brazilian federal public service, determining the preparation and implementation of the Sustainable Logistics Management Plans (PLS) [14]. Then, the Department of Logistics and Information Technology (SLTI), linked to the then Ministry of Planning, Budget and Management (MPOG), launched the Normative Instruction (IN) No. 10/2012 2012 [119], determining rules for the preparation of the PLSs.

Finally, the PLS in Brazilian HEIs must establish sustainability practices and rationalization of expenses and processes in public administration, which includes the forecast of actions that focus on sustainable actions, from the bidding processes to the operationalization of the HEI. There is the need to continue implementing an environmental management

system in Brazilian universities, mainly in institutional policy and pedagogical political projects, reinforcing the campus commitment to the sustainability of the HEI [102].

Timidly, in the Brazilian context, sustainable practices in HEI have been occurring, although the figures on higher education in Brazil show that there is a range of institutions that can take the lead in sustainable practices in the country, considering that Brazil in 2019 already it had 2608 HEIs, 11.6% being public and 88.4% being private [120].

Of the public HEIs in Brazil, 43.7% are statewide, 36.4% are federal, and 19.9% are municipal, with the majority being faculty/university centers (49.7%) and 35.8% being universities. In private HEIs, faculties/university centers are large (96.1%), and a small portion are universities (3.9%). Although most HEIs are from colleges, only 19% of undergraduates are enrolled in them. The majority of students (52%) are in universities. As for the teachers working in the public higher education system, the largest number are doctors (66%), and 24.8% are masters; in contrast, in private HEIs, there is a higher percentage of masters (48.3%) and 28.9% are doctors [121].

In terms of Brazil's regionalization, the North Region, which this study is focused on, has the lowest number of HEIs (6.3%—24 public and 167 private) and is in last place compared to the four other regions of the country, where the Southeast, in addition to holding the largest number of HEIs (37%), is the most industrialized region in the country. This region, in terms of population, takes the penultimate place in number of inhabitants, ahead of the Center-West Region, however, it has the lowest number of HEIs and students among all Brazilian regions [120,122].

About 90% of the Amazonian biome is located in the North Region of Brazil, as well as the political-administrative region of the Legal Amazon, which occupies 59.8% of the Brazilian surface and is a territory with strategic geopolitics for the country and the world [122,123]. The Brazilian Legal Amazonia encompasses the entire North regional portion and also part of the Midwest (State of Mato Grosso) and Northeast (181 municipalities in the State of Maranhão) [122] regions where there is a smaller number of HEIs present in general terms of the country. Therefore, in the Amazonia, this smaller number of HEIs is an obstacle to be overcome, considering that education has an important role in the strategy of sustainable regional and national development.

A study on the interiorization of public higher education in the Amazon since the last century shows the influence in this region by what happened in other parts of the country, driven by a global trend at the time, in this sense, the expansion of the university occurred to solve problems socioeconomic (urbanization, social and economic inequalities, impacts on productive means and ecological aspects, etc.), but demands such as knowledge, technologies, qualification of the workforce, and the management of social conflicts were also taken into account [124].

In verifying the sustainable practices of Brazilian universities, the researchers consulted 123 HEIs with the best performances according to the Ministry of Education—MEC. In 31 of them, there were no activities related to sustainability, which reduced the number of HEIs with this purpose by 25%. Therefore, research in 92 HEIs showed that of these, 52 are private and 40 are public, with 52% located in the Southeast region of the country, 21% in the Northeast, 21% in the South, 5% in the Midwest, and only 1% in the North. Again, the reduced number of HEIs, this time with a sustainable focus, occurs in the northern portion of the country [125].

However, in general terms of the HEIs that could be investigated, the authors perceive that the Brazilian HEIs are in line with international sustainable practices of sustainability, even though these practices require great effort and investment. In 28 of the institutions, the only form of sustainable practice is related to offering courses and lectures in the area. A very positive point is that many of these HEI offer extension and postgraduate courses related to sustainability. The diversity of sustainable practices is mainly related to education (environmental education), and then to the theme of health and sanitation (waste, sewage), sustainable buildings, energy efficiency, water, etc. There is always an interest in extending the initiatives also to external communities [125].

Regarding sustainability publications by Brazilian universities, these are still dispersed and do not have specialists on the subject. They usually come from a group of researchers from four universities located in the southeast and south regions of the country. In the perceived initiatives, there is an interest in two axes: the academic, emphasizing Environmental Education in teaching and research, and the operational one with infrastructure actions and management services, focusing on solid waste management and other environmental practices (water, green areas, buildings, and energy) [126].

In consultation with GreenMetric's 2019 and 2020 lists, which classify universities around the world using sustainability indicators [127,128], there are 778 participating HEIs in 2019, and in 2020, this number rose to 912 (Table 3).

Table 3. Position of Brazilian universities in the GreenMetric 2019–2020 world ranking of sustainability.

Classification of Brazilian HEI in GreenMetric						
	2019 Ranking			2020 Ranking		
Position BR	Position Worldwide	HEI	State	Position Worldwide	HEI	State
1st	18th	University of São Paulo (USP)	SP	13rd	University of São Paulo (USP)	SP
2nd	29th	Federal University of Lavras (UFLA)	MG	30th	Federal University of Lavras (UFLA)	MG
3rd	73rd	Positive University	PR	100th	University of Campinas (Unicamp)	SP
4th	80th	University of Campinas (Unicamp)	SP	101st	Federal Institute of Education, Science and Technology of Southern Minas Gerais	MG
5th	149th	University Center of Rio Grande do Norte (UNI-RN)	RN	166th	University Center of Rio Grande do Norte (UNI-RN)	RN
6th	162nd	Federal University of Vicosa (UFV)	MG	197th	Positive University	PR
7th	227th	Pontifical Catholic University of Rio De Janeiro (Puc-Rio)	RJ	206th	Federal University of Vicosa (UFV)	MG
8th	234th	Federal Institute of Education, Science and Technology of Southern Minas Gerais	MG	224th	Federal University of Rio Grande do Sul (UFRGS)	RS
9th	237th	Federal University of Mato Grosso do Sul	MS	226th	Pontifical Catholic University of Rio De Janeiro (Puc-Rio)	RJ
10th	259th	University of Vale do Itajaí (Univali)	SC	242nd	Federal University of Mato Grosso do Sul	MS
11st	306th	Pontifical Catholic University of Rio Grande do Sul (Puc-RS)	RS	256th	Facens University Center	SP
12nd	312nd	Federal University of Triângulo Mineiro (UFTM)	MG	286th	Federal University of Itajubá	MG
13rd	339th	Federal University of Itajubá	MG	317th	Federal Fluminense University	RJ
14th	348th	Federal University of Rio Grande do Sul (UFRGS)	RS	322nd	University of Vale do Taquari (UNIVATES)	RS
15th	360th	UFSC Petrassi	SC	357th	Federal University of São Carlos	SP
16th	394th	State University of Londrina	PR	362nd	Federal University of Triângulo Mineiro (UFTM)	MG
17th	397th	Federal Fluminense University	RJ	378th	University of Vale do Itajaí (Univali)	SC
18th	404th	National Commercial Learning Service National Department (Senac)	MT	436th	National Commercial Learning Service National Department (Senac)	MT
19th	429th	Federal University of Rio de Janeiro	RJ	439th	University Center of the Fundação Hermínio Ometto (FHO)	SP

Table 3. *Cont.*

	Classification of Brazilian HEI in GreenMetric					
	2019 Ranking			2020 Ranking		
Position BR	Position Worldwide	HEI	State	Position Worldwide	HEI	State
20th	434th	Pontifical Catholic University of Paraná	PR	456th	University of Passo Fundo	RS
21st	473rd	Pontifical Catholic University of Campinas	SP	490th	Federal University of Santa Catarina (UFSC)	SC
22nd	478th	Federal University of Alfenas	MG	506th	Pontifical Catholic University of Rio Grande do Sul (Puc-RS)	RS
23rd	506th	Federal University of São Carlos	SP	514th	Pontifical Catholic University of Campinas	SP
24th	527th	Federal University of Ceará	CE	515th	Federal University of Alfenas	MG
25th	602nd	State University of Maringá	PR	524th	Federal University of Santa Maria	RS
26th	639th	Federal University of São Paulo (Unifesp)	SP	530th	State University of Londrina	PR
27th	654th	Federal Institute of Education, Science and Technology of Rio Grande do Norte (IFRN)	RN	532nd	Federal University of Ceará	CE
28th	729th	Toledo Institution of Education	SP	537th	State University of Maringá	CE
29th				541st	Pontifical Catholic University of Paraná	PR
30th				576th	Federal University of Rio de Janeiro	RJ
31st				657th	University of Sorocaba	SP
32nd				687th	Federal University of São Paulo	SP
33rd				722nd	State University of Maranhão	MA
34th				761st	Federal University of Western Pará (Ufopa)	PA
35th				773rd	Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte (IFRN)	RN
36th				813rd	Instituição Toledo de Ensino	SP
37th				834th	Federal Institute of Education, Science and Technology of Southeast Minas Gerais	MG
38th				855th	State University of Amazonas	AM

A closer look at Brazilian HEIs shows that, in 2019, 28 of them make up the sustainability ranking, 7 private (25%) and 21 public (75%) [115], and in 2020 it rose to 38 universities, 14 private (36.8%) and 24 public (63.2%) [129]. In this sense, there was an increase in the percentage of private Brazilian HEIs in the ranking.

Two Brazilian public universities ranked in both the 2019 and 2020 listings. There is a state HEI among the 20 best in the world and a federal one among the 30 best. Among the 100 best in the world in 2019, there were 4 Brazillian HEIs, but in 2020 it dropped to 3 (Table 3). In the 2020 list, they now comprise two universities in the North of Brazil, a fact that took place for the first time since 2010 when the classifier began operating the sustainability assessment in HEI.

In conclusion, of the Brazilian HEIs that appear in the 2019 list of the ranking, most of them (82%) are located in the South and Southeast regions of Brazil, highly industrialized, populated locations with more basic service offerings. Among the others, 11% are HEIs in the Northeast, which is the region in the country with the second highest percentage of

HEIs and enrolled students, another 7% are from the Center-West region, no HEIs in the North Region made up the ranking until the most recent release in 2019, and in terms of location in the Legal Amazon, only one HEI, in the State of Mato Grosso (MT), was among the classified Brazilian ones (Figure 8).
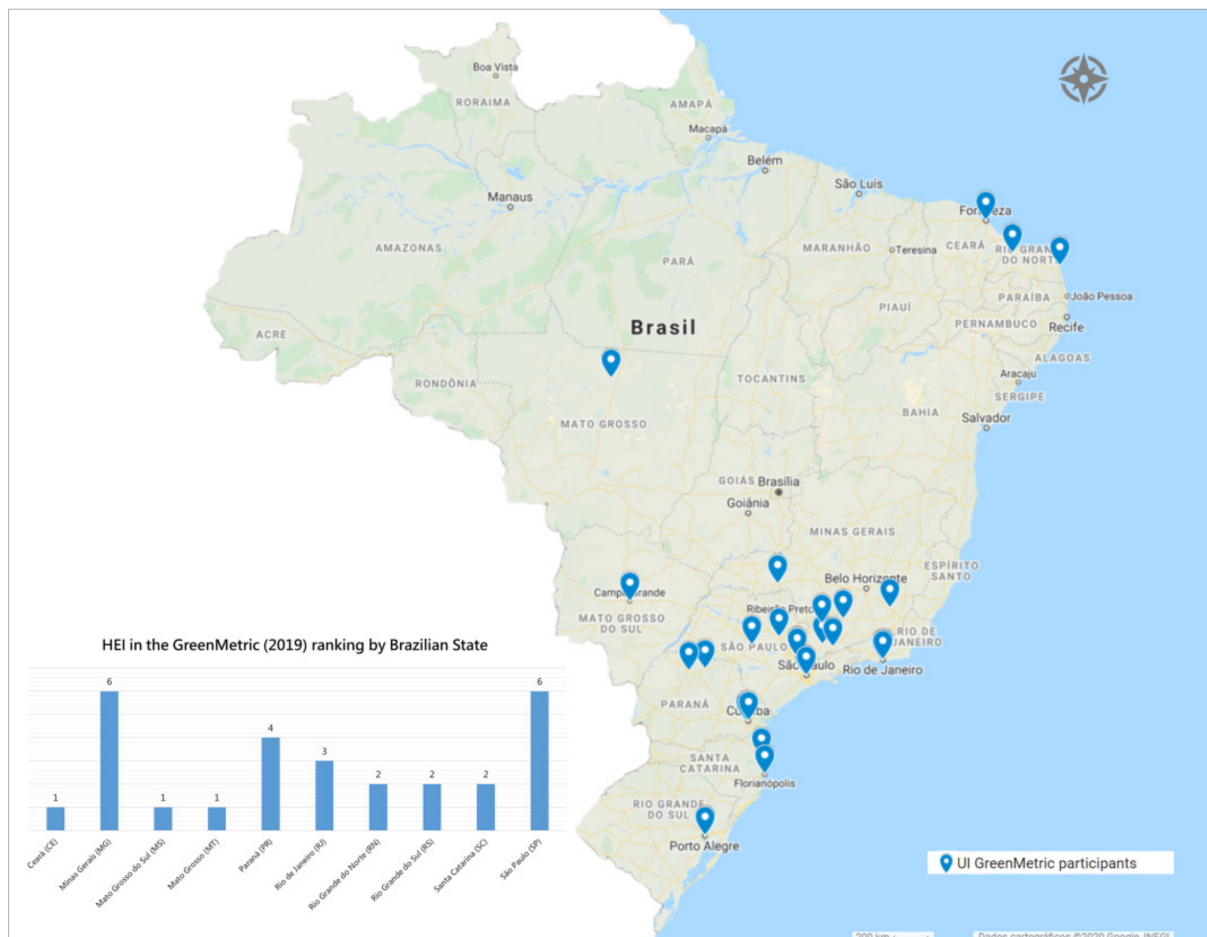

Figure 8. Brazilian universities in the GreenMetric 2019 world ranking of sustainability. Source: adapted [115].

In the 2020 classification scenario, a state HEI in Amazonas and a federal HEI in Pará, both public, are now part of the global list and, with this, the Northern Region of Brazil is inserted as being represented in the national scenario. For the Legal Amazon scenario in 2020, in addition to the two HEI in the North region that debuted in the ranking and the one in Mato Grosso continued, there is also one from the State of Maranhão as a sustainable Brazilian institution (Figure 9).
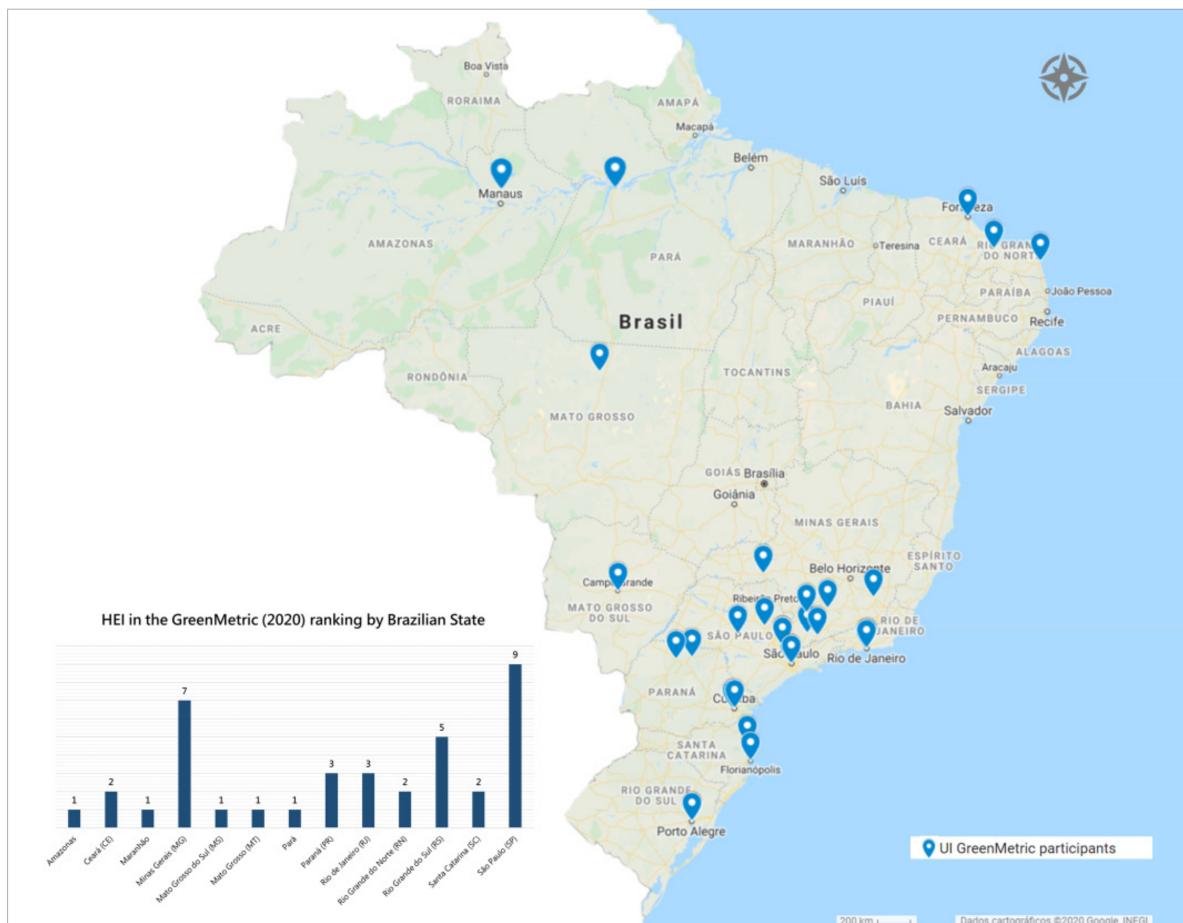
Figure 9. Brazilian universities in the GreenMetric 2020 world ranking of sustainability. Source: adapted [129].

5. Conclusions

The theoretical survey in this study was satisfactory and showed that since 1950, in the post-war period, universities were encouraged to take their position in society as the agent capable of helping and operating emerging socioeconomic and technological problems. Thus, the main objective of this study to verify and analyze the movement and actions around the conceptual model of SU in the world and its expansion to HEIs in the Brazilian Amazon region was achieved.

Through the timeline over 7 decades, the outstanding role of HEIs can be seen in almost 50 episodes, which raised a new pattern of global development, either acting as a protagonist or indirectly in the sustainability paradigm. The sources consulted for the timeline, despite bringing together dozens of HEIs under the guidance of researchers and technical-scientific consultants, are not exclusive generators of scientific content, but it is suggested for future research to make greater use of these entities' databases, in particular about the political-institutional articulations between them and issues of global relevance in support of scientific investigations of sustainability in universities.

This study also gathered nearly 90 scientific publications from 1980 to 2020, which show the indigence of HEIs in repositioning themselves and facing the challenge of advancing together with political and social transformations, seeking to set aside traditional elitist models and assume aspects that made suitable for the process of sustainable development, whose germination occurred in the 1970s but was enunciated in the 1980s.

After the establishment of the conceptual framework of the SD paradigm, universities turned to their role in this new context. Thus, the 1990s were intense and productive for HEIs, with debates, analyses, and the constitution of a model of an institution that is

environmentally aware of its role in society generating important historical documents of engagement worldwide.

Since then, the creation of associations, events, agreements, public policies, and other instruments to encourage the adoption of rational and sustainable practices have been discussed and implemented in HEIs around the world, with a strong presence of Europeans. The insurgency of the movement of university leaders (deans) in countries in Europe and North and Central America was decisive in expanding the concept of SUs to other parts of the world.

Currently, it appears that HEIs focused on changing to the SU model are seeking to prioritize, in their entire educational process, the efficient use of natural resources and ensure balanced, fair, and integrated socioeconomic development to the teaching axes, research, extension, and good governance, not just for your internal community but the external community as well.

For researchers, the current state shows that the challenges to achieving full sustainability are still many, since complexity is part of this model, and for this reason, several universities around the world have been adopting a role of transformation by example, seeking to be leaders for society through aligned sustainable discourse and practices.

In Brazil, the path taken by HEIs has shown a certain willingness to address environmental issues, especially with activities related to education (Environmental Education) and campus operations, such as in the areas of solid waste, sewage, water, energy, and buildings.

Notably, since 2012, the Brazilian federal legislative framework has demanded a more effective performance in sustainable practices by federal universities, which are normally the main references in higher education in the country. Private HEIs in Brazil are exempt from this legal compliance; however, future studies to analyze pro-environmental behavior in private universities, and even compare them to public ones, may fill this knowledge gap and broaden the understanding of SUs in the Brazilian context.

However, the uniform path to SUs in Brazil is not a reality, as the universities with the largest publications on sustainability are concentrated in the southeast and south of the country. Another observation is that, despite Brazil having been the site of historical world events on sustainability and having had some universities engaged as signatories to relevant international agreements and documents, there is a lot to go forward for the country when it comes to becoming a global leader in sustainable practices in HEI.

This study also verified that most Brazilian HEIs are outside the listings of a global sustainability ranking in universities. In 2019, there were four Brazilian HEIs among the 100 best in the world in this classifier, and in 2020 this number reduced to three HEIs. Until 2019, the Northern region of Brazil, which encompasses 90% of the country's Amazon biome, was the only one among the five regions that did not make up this ranking of sustainable practices, however, in 2020 two public HEIs in the north became part of it. This is not the ideal scenario for Brazil when it comes to SUs, but it is expected that interest on the part of HEIs will increase and the internal movement will be consolidated, with the strengthening of internal networks of SUs and the adhesion of HEIs in the Amazonian region in these organizations.

Therefore, it is necessary to broaden and deepen environmental practices and dialogues in Brazilian HEIs for the path of improvements and transformation in SU, as well as increasing research that can broaden the understanding of the situation and verify the main barriers to the advancement of sustainability in these HEI. Undoubtedly, it is imperative to encourage all Brazilian HEIs for the effective conception of the SU, specifically, those from the Amazon region, so that it generates more knowledge of this regional context, and that their HEIs gain greater visibility in the national and international scenario.

Our study brings to the global debate on SUs information about HEIs inserted in the Brazilian Amazon region, which, in the context of this regionality, lacks further investigation on the sustainable practices of their universities. This research found a limitation related to the reduced scientific production on the sustainability of Brazilian HEIs in the

period investigated since it was limited to scientific databases that allowed full access to full texts.

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