

Challenges and Strategies for Sustainable Development in Universities: Conceptual Framework

Abstract

This paper evaluates the role of planning and strategies to enhance the integration of sustainable development within Higher Education Institutions (HEIs), using an active HEI as a case study. It explores challenges in embedding sustainability into institutional structures, ICT services, teaching, and campus design. The research emphasizes the fundamental importance of planning in enabling the institution to become actively engaged in sustainability. Several steps for effective planning implementation are proposed, acknowledging that the process is ongoing and that new strategies may emerge. The study contributes to the literature by offering concrete implementation strategies and examining the roles of barriers and incentives. In an increasingly uncertain world, HEIs face growing societal demands to integrate sustainability into curricula, research, and campus operations. Using a threat/sustaining processes framework from strategic management, the paper analyzes factors that hinder the integration of sustainability. The study adopts a qualitative case study approach focused on curriculum development, using document analysis and semi-structured interviews. Multiple barriers are identified, including lack of leadership, limited strategic vision, and structural or cultural issues within departments and programs. The paper suggests ways to overcome these obstacles and highlights the need for deeper research into the dynamics, persistence, and transformation of barriers and incentives to support sustainability-oriented institutional change.

Introduction

Sustainable development, often abbreviated as SD, is understood as the process of meeting the needs of the present without compromising the ability of future generations to meet their own needs, also known as inter-generational equity. Education has a central role to play in moving towards a more sustainable future. To educate the generations who will ensure a more sustainable world, more sustainable institutions of learning and education systems and institutions, including universities, are needed. Universities face particular complexities and challenges in moving towards sustainable development. Moreover, universities in Eastern Europe, Africa, Asia and Latin America are lagging behind. There is a need to raise awareness, enhance understanding, improve knowledge, build capacity, change mindsets and cultures, build networks and partnerships for sharing information and knowledge and collaborating in initiatives (Leal Filho et al., 2017). Universities in the Northern Hemisphere (west of Europe, Canada and the USA) and in some countries such as Australia, Singapore and Japan have made advances and put in extensive efforts in the field of Education for Sustainable Development (ESD). Some have moved towards Education for Sustainability (EfS), i.e. planning and implementing educational efforts so that all education and training for sustainability is environmentally, socially and economically

sustainable. However, efforts for education for sustainable development have not as yet been put in other countries like those in the Eastern segment of Europe, Africa, Asia and in most of Latin America (Filho et al., 2019). Accordingly, there are different starting points and recommendations needed, whilst political, economic, social and cultural context needs to be taken into account.

Understanding Sustainable Development

In recent decades, the occurrence of world crises, such as terrorism, wars, pandemics, global warming, and resource collapse, has led to a radical change in thought among scholars in the field of higher education. Mentoring students capable enough to encounter and tame these problems has become one of the major goals of the universities across the world (Leal Filho et al., 2017). To do this, the paradigm of focusing mainly on creating knowledge and monitoring scientific climb is shifting to a more enormous horizon, namely sustainable development, which is defined as satisfying present needs without compromising future generations' needs. This term contains not only personal and scientific capacity building but also social awareness and behaviours that individuals require to preserve human society, the planet, and all its extraordinary biological diversity for millions of years to come (Filho et al., 2019). In this regard, sustainable development goals are drawn globally to represent the aims of how to tame crises in many disciplines. Furthermore, among the involved parties, higher education institutions, mainly universities, are expected to assume this responsibility first. To meet this, universities across the world are trying to achieve sustainable development by developing educational contents, scientific outputs, operations, and other services that influence their community and the following generations. In brief, while there are wide wonderful efforts to attain sustainable development by the universities globally, incorporating sustainability into universities is very complex and needs some major changes, which involve the overall system redesigning under the sustainability context.

Definition and Principles

The concerns of environmental degradation as a result of social actions to increase quality of life through economic and infrastructural expansion initiated awareness actions that concentrated their interventions in specific themes such as recycling, waste management, biological extraction, or legislative regulations. With increasing awareness of the systemic interlinkages between the dysfunctions of human societies and climate change, biodiversity losses, and soil impoverishment; sustainability efforts evolved to views of sanity that informed about the unsustainable operation of existing systems, as well as the principles and guidelines of their sustainability (Leal Filho et al., 2017).

Universities worldwide have been changing their missions. Recently updated views describe the universities' missions as "knowledge-generation, lustrous discourse, provide critical assessment of society's norms, advance the development of social, cultural, scientific and engineering fronts to respond to global expectations and needs, and provide decision making protocols." Given their responsibilities to fulfill mission expansion, universities advocate to integrate sustainability in all their functions variously termed education-for-sustainability, transformational learning, or planetary stewardship. To operationalize sustainability integration, apart from the uncertainties of the new mission, universities face the challenge of reconciling sustainability with their widespread growth strategies that risk losing functional integrity. (Abo-Khalil, 2024)(de et al.2025)(Tien et al.2021)(Kaiser, 2023)

Importance in Higher Education

The 2030 Agenda for Sustainable Development includes 17 Sustainable Development Goals (SDGs) which are all relevant to an improved quality of life in harmony with the nature (Leal Filho et al., 2017). The objectives at many universities are to respond, where possible, to these challenges with well-articulated initiatives, especially in teaching and research. There are, however, many short, medium and long term challenges to sustainability for universities in terms of strong vested heartfelt opposition to such a positive action.

The introduction and implementation of sustainability in the reality of higher education institutions (HEIs) is at an incipient stage in many parts of the world. However, there are progressive institutional policies, mechanisms for cooperation, tools and resources for developing sustainable development projects and activities in universities with multi-disciplinary, multi-level, multi-stakeholder approaches. The introduction of the principles and practices of sustainable development (SD) at the higher education level has been done through several formal and practical challenges. Many approaches to implement SD into the curriculum in higher education have been proposed. Most of the challenges and issues identified were centred on a lack of motivation or commitment of institutions, faculties and students and the restriction imposed by curricula rigidity at many higher education institutes. It is evident that there is an immediate imperative need for sustained and intensified efforts to address these concerns and issues. Academicians, administrators and students at the HEIs need to encourage and stimulate teacher centred sustainability approaches. (Berchin et al.2021)(Crawford & Cifuentes-Faura, 2022)(Žalėnienė & Pereira, 2021)

In universities in the Global South there are challenges surrounding both social and environmental sustainability which are more acute and more serious compared to universities in the Global North. The Global South and in particular the Least Developed Countries share a set of multilevel and multidimensional sustainability

challenges of chronic poverty, disease, corruption and mis-governance, political unrest, military strife, lack of fundamental educational and social services, and climate change. It is for this reason that it is timely to reflect on how universities in these countries are currently failing at their most fundamental and noble purpose which is knowledge creation. There are a number of ways for responding to this multilevel and multidimensional crisis. The SDGs place a spotlight on the crisis confronting HEIs and offer them, with considerable urgency, a unique opportunity to reflect on the ways in which they currently operate and offer important reasons for the need for them to change and opportunities to make such change. (Mpofu-Hamadziripi et al., 2022) (Krishnamurthy and Sahay2023)

Current Challenges in Universities

The changes that societies are experiencing due to global environmental change and the concept of infinite economic growth on a finite planet are so pervasive that it is not possible to isolate sustainability considerations to specific themes, groups or geographical areas (Leal Filho et al., 2017). Therefore, these topics must be understood in their multi-dimensionalities and inter-connectivities. While individual responses to sustainability challenges are of interest to researchers, these responses can only be fully comprehended, appreciated and disseminated by adopting a systems perspective. (Javanmardi et al., 2023)(Berjawi et al.2021)

Universities and higher education institutions have always played a critical role in society. They have produced adequate knowledge, trained policy-makers and raised public awareness. However, many HEIs are still far from addressing sustainability in an adequate way. Moving from an interest-oriented, unsustainable and/or conflicting understanding of sustainability to an integrated, reflexive and participatory understanding of sustainability on global, national, local, social, economic and ecological levels appears to be one of the most important challenges of the 21st century towards a sustainable future. Significance and approaches of sustainability-orientated transformative interventions in the HE sector have been discussed points in educational and social research for many years. (Berchin et al.2021)(Leal et al.2023)(Mokski et al.2023)

Nevertheless, universities can only be successfully transformed into sustainability-orientated organisations if sustainability is fully, adequately and firmly recognised and implemented in university systems. Hence, an understanding of sustainability as a cross-cutting topic that is relevant for all themes and disciplines in a holistic and synergetic way is a precondition for an adequate implementation of sustainability in universities. Although there have been proven and successful developments in the field of Higher Education for Sustainable Development over the past 15 years or so, there are still numerous challenges to be overcome. The results of an empirical study

performed with universities across the world, which aimed to identify barriers to implementation of sustainability. (Mohamed et al.2022)(Price et al., 2021)(Voulvoulis et al.2022)

Financial Constraints

Universities choose to prioritize projects that ensure high returns in cash, with the view of sustainability being a long-term implementation interest and not necessarily a priority for most university administrators. In addition, such projects, like front buildings that enhance biodiversity will take time to be evident to the administrators. Middle-level administrators also do not want to take the risk of proposing initiatives that require caution or a careful approach that could render them unpopular with the higher authorities. Such bias occurs because these initiatives may not yield much in pressing success of the university's vision, mission, or KPIs (Joel Todowede, 2014). Most university administrations are composed of a group of individuals with a wealth of expertise in politics, finance, and economics. In behavior, universities almost regurgitate the treatment strategies for transference or adaptation as miracles. The sheer size of the selected meeting lists adds more complexity than intended hardware solutions; it does not call for new benchmarks or logics about how to arrive at the decision. Even as their monthly number of meetings and reported 'decisions' on perceived loopholes soars, everything seems to remain more or less unchanged. There seems to be a paradox in play here. The silos may exist as rigid bureaucracies at the department level of universities, but at higher levels, they suddenly become fluid (Leal Filho et al., 2017). Most campus administrators see their university vision being much more accurately articulated in terms of 'financial health' than sustainability or equality. Ultimately, only projects that boost immediate financial income can be expedited while everything else has to compete hard. At present, the chance is slim of any sustainability projects being prioritized over other campus infrastructure development projects. Therefore, this issue points to a general outlook that sustainability is merely a means of information picking that is conducive to public relations gains in the eyes of followers and subsequently elitism ahead.

Institutional Resistance

Aside from skepticism about the urgency of the challenge and unrelated local circumstances, resistance towards sustainable development across institutions is more often structural than personal. A bureaucracy resists meaningful change because it is, above all else, concerned with expanding its own power and operational self-importance. The institutional barriers identified include "lack of funding, lack of niches into which to place innovative actions in regards to the trans disciplinaryity required to do sustainability education, [and] lack of the financial resources to buy time to devote to research or sustainable development initiatives" (Leal Filho et al., 2017). Having made the observation that institutional barriers exist almost by definition prior to

embarking on any assessments of sustainable development, it is nonetheless of interest to note that without such resources as are mentioned, the obvious actions taken by many academic institutions are typically impossible. This means that hierarchies must be found to channel both the genuine learning emergent from tasks as routine as cataloguing the hours devoted to a new form of course writing, or the apparition of forms of co-authored dialogues between scientists and those who must make applications on the new knowledge. Bureaucracies resist change not simply as a reaction to cognitive dissonance or because of conflicts of interests, but also as a matter of structural lack of resources. Institutional barriers highlighted include “too much bureaucracy, teaching for the wrong reasons and a form of institutional idiocy mainly observed in bigger institutions. All these barriers relate to grafts which have taken root in the institutions and stifle genuine capacity to co-intelligize the urgent challenges posed by sustainability. Government barriers listed included “lack of funding and lack of government facilitation of financing routes or support for the innovation of sustainability related forms of education in Universities”. The acknowledgement of resistance by faculty members, students, organizations and governance will seem particularly familiar to earlier Post-Environmental Education Dialogues. A continuing refrain in the observations and suggestions of sustainability and education experts working across the world in many vocational sectors is the need for all interested parties in the “drama of SD” such as students, educators, administration, faculty and organizations. (Abo-Khalil, 2024)(Singun, 2025)(Gardner et al.2021)

Lack of Awareness and Education

Ignorance of students or ignorance of staff can crystallize into lack of awareness of possible actions, motivations, and changes in behavior that contribute to a more sustainable university. A combination of factors fortifies this problem. In some universities, it is not possible to determine who, if anyone, is responsible for sustainability issues. Some study programs include sustainability but many do not. From an administrative point of view, this can lead to “black holes”, where things get stuck. Academic staff (teaching and research staff) may have a vague idea of who is in charge of sustainability issues in the university, and a few can name the physical officer or contact person responsible for sustainability on campus. Even fewer know which faculty or research center has responsibilities concerning sustainability issues. Subsequently, very few academic staff know where and how to find information on sustainability issues and existing initiatives or changes in priorities on sustainability actions. Students are very ignorant of sustainability governance issues at their university. Only a few have heard about the strategic university sustainability committee. There is an almost complete ignorance of sustainability offices or contact persons. This makes it difficult for students to engage in sustainability-based initiatives (Leal Filho et al., 2017).

Very few other respondents were aware of educational efforts concerning sustainability or sustainability science. A few mentioned different websites where sustainability-related courses, knowledge, or teaching experiences could be shared, but they related to “green” engineering courses. While academic publications like the recent “Sustainability in higher education” with 78 papers and a couple of books on university-wide sustainability information systems and programs are identified, nothing local, gender-unfriendly, or non-political was found. Most public institutions have public web pages that may provide an information and communication platform for university sustainability activities and developments. At least on the internet, a waste site with sustainability-related issues at the sampled universities should be able to be found. Sustainability reports could become more detailed and also include sustainability indicators, goals, actions, initiatives, etc. Information could be further disseminated using for example university sustainability newsletters, both electronic and paper-based. (Yusuf & Fajri, 2022)(Leiva-Brondo et al.2022)(Debrah et al., 2021)

Environmental Impact

Today, rapid development of technology and science is one of the main challenges for local and global sustainable development. All the countries are either developing or developed countries are sought solutions for these issues. The theories of sustainable development and the concept of sustainable cities formed in order to overcome this crisis and great efforts have been carried out to produce sustainable environments on land planning and architectural design scales. With this purpose in mind, the researchers tried to investigate the challenges for sustainable development in developing countries (Becker, 2023)(Hajian & Kashani, 2021)(Mondejar et al.2021). Meanwhile, some strategies were also proposed to overcome these challenges and to create sustainable cities. The challenges were considered in different layers such as culture, policy, decision making, finance and investment, public participation, socio-physical, institutional and human resource capacity, natural environment, and technology. Each of these challenges was dealt with separately to show the problems face to the developing countries. Furthermore, comprehensive practical strategies were proposed for consideration. These strategies were mainly considered on urban scale. This is very important factors affecting either opportunity or challenge for sustainable urban development at the university level. (Chatzitheodoridis et al.2022)

Safety of site and buildings is a decisive issue in designing sustainable universities. Natural hazard mitigation design strategies should be considered for assessing seismic, mine subsidence, flood, and or other natural hazard risk of possible sites for campuses and overseeing compliance with appropriate design and construction standards. Strategies should be developed, as appropriate, to protect buildings and infrastructures from terrorism and/or other manmade attacks. Pedestrian access should be designed to minimize at-grade intersections with vehicular traffic (Nikpour & Pooladkhai, 2012).

Strategies for non-vehicular transportation should be developed to enhance access for pedestrians and cyclists. Moveable partitions should be utilized in classroom space design to facilitate classroom size adjustment. Places needed to be considered into planning to enhance opportunities for students and faculty interaction. A space should be developed in every building for students to congregate. Pockets of seating, small meeting areas, and display space should be included in the building design. Building corridors should be wide enough to provide informal meeting opportunities. Anyone should be considered in designing buildings to accommodate and promote usability by diverse populations (Rahmelia et al.2022)(Alimron et al.2023).

Strategic Approaches to Sustainability

Despite the challenges associated with implementing planning frameworks to support the integration of sustainability in all aspects of the university, a large number of lessons learned have emerged. The majority of these insights are related to the bureaucratic, political and participatory aspects which the universities have had to deal with after the planning activities were finalized. Lessons learnt range from the times prior and during the planning processes up to the implementation attempts and include comments both on a personal and institutional level (Filho et al., 2019).

Five insights were defined as being of particular interest to other universities: Limited awareness and understanding about sustainability and low importance afforded to SD matters. A large number of universities, even though they have been created for more than seventy years, display a poor understanding and awareness of sustainability issues and challenges. Universities need to go beyond the simple academic treatment of issues related to SD and identify ways how SD should impact the “day-to-day functioning” at the individual, departmental and institutional levels. An increasing number of universities have already developed their respective SD plans and even though some of these strategies display a well-founded and multi-faceted approach, in the majority of the cases these strategies betray a limited understanding of sustainability, a high degree of institutional insularity and low know-how on how to effectively transform university practices (Leal Filho et al., 2017).

To resolve this issue, universities need to develop partnerships with other universities either in their own countries or regionally or engage in international programs with the purpose of consolidating and further developing their know-how about sustainable development implementation strategies. This insight has to do with the lack of an official body responsible for SD implementation by a senior official for SD matters, with the Degree of Doctor or at least a member of the Academic Senate. This official body is a tangible indicator of the university’s support and commitment towards significant progress in advancing sustainability on campus. Not all universities have a planning framework supporting the SD implementation. Investing in a planning

framework is necessary. With it all members of the academic community and also the student body can be engaged, areas where sustainability efforts are needed in the short, medium and long-term can be addressed. (Leal et al.2021)(Aljuwaiber2024)

Curriculum Integration

Sustainable Development (SD) is one of the greatest challenges of the 21st century. The United Nations has drawn attention to it through definitions and in international forums and agreements involving diverse players. Among them, Higher Education Institutions (HEIs), which are in a privileged position to respond to this challenge, given their role as producers and disseminators of knowledge and significant communities of society. The need now is to find ways to overcome traditional practices and to focus not only on new knowledge, but also on new frameworks. It has proven difficult to move knowledge from one brain to another. The search for new forms of knowledge was drawn on decades earlier by philosophers such as Gadamer and Habermas. On this basis, it has been on the agenda of political leaders and knowledge producers during the last generation or before but proven evidently more difficult to find such solutions (Leal Filho et al., 2017).

Nevertheless, there is considerable awareness about the issue, and initiatives are being taken on many fronts to overcome this challenge at all levels of society. Some HEIs have taken the lead by proposing other inputs to the system, such as different types and sources of knowledge, new epistemologies, and interpretative frameworks. Conclusions should be placed on the issues of the science–policy interface, segment of those who follow bear in mind the need for HEIs to move towards either a multi-level or a multi-segment perspective as part of their efforts to learn from, influence, and interact with civil and political society in order to have a real impact on SD outcomes. (Luo et al.2022)(Zheng et al.2023)

In the global media, there are numerous reports about what changes need to be made for society to reach better opportunities, and scenarios of warnings about the future are shared frequently. A new methodology has been constructed for running ideal-hearings with students with different backgrounds. The purpose of the exercise is to find unheard voices and discuss unwanted assumptions related to the educational design in focus.

Research and Innovation

One area in which universities can improve sustainability is in their research and innovation (Leal Filho et al., 2017). Universities are fertile grounds for scientific knowledge to create solutions for a plethora of issues. However, many universities continue to struggle with the implementation of sustainability despite its importance. Green engineering, biotechnology, clean energy production and storage, waste treatment, global pollution management, and other scientific advances are ample across universities. Yet, accepted university structures remain oriented to particular fields'

knowledge and the fragmented production of research. To develop successful innovations that would promote sustainability, collaborations beyond disciplines should be enabled. Sustainable development is a global objective to overcome, in a fair way, the cascading economic, environmental, and societal crises. The informal dialogue predominant among faculty, students, and owners is characterized by a mismatch of priorities. Faculty members are more worried about salary, job stability, and the ranking of their graduate program than educate/research; students that are more worried about titles than learning; owners are worried about profit than education. Conversely, a series of barriers are encountered: the most important one is lack of funding/investment for new programs, such as either an academic program or daily life process; lack of niches for innovative ideas that were tried failed resulted in a mind of mind-setting; weak recognition of trans disciplinaryity as a pathway to combine knowledge and de facto issues; and lack of financial resources oriented to innovation.

One of the most relevant obstacles to universities implementing sustainability was competitive bureaucracy and working for the wrong reasons. The most important obstacle faced to promote practice at universities was related to a lack of funds and government support for the practice of sustainability-related innovation. The development of enabling innovations should follow from research at the very universities and faculties that are encouraging practice-oriented teaching. On the other hand, the mobilization of networks is critical to fill the gap of integration. The most significant obstacle to universities working together on sustainability-related innovation implementation is that university- and competition-oriented setting limiting experiments. Two cases of universities as living laboratories of sustainability were presented. Innovations that were admitted by traditional scientists yet criticized were strictly based on what students could examine. Technical advances developed beyond faculty staff's fields are implemented with school-wide implications. These findings offer evidence that collective effort is underway to present sustainability-oriented, more modern curriculum, policies, and standards, which would sustainably transform higher education.

Campus Operations and Management

There are significant differences in campus operations among universities, and not all campuses will get to the “greener” level where some others are immediately. Universities should consider the seven general approaches examined in the study by (Gregory Jesus Coffie, 2005). It is likely that, in each case, a combination of approaches will emerge and that the particular mix will relate to culture and social structure. It would be advantageous to adopt approaches that follow natural decision-making sequences. For example, the discussion of budgets is preceded by the observation regarding contracts. Universities should develop a sense of network among themselves, not only for economic advantages but also for a more constructive distribution of

approaches to common tasks. A divide-and-conquer strategy on the part of suppliers—and the inability of many universities to “think as one”—discriminates against universities and the communities around them.

The examination of the case of Manchester Metropolitan University (MMU) led to a number of general conclusions and recommendations in the four strategic areas, despite the particular context and limitations of the study (Tinker & Tzoulas, 2014). It had soon become apparent that there was a wide number of environmental management systems (EMS) frameworks and processes in existence and ongoing efforts at MMU. The key challenge was how to develop an integrated university wide EMS built on current best practice and involving as many staff and students as possible. There were also serious limitations in terms of staff time and resources which restricted how many of the ideas and suggestions could be actually realized. A participatory approach to the development of an EMS at MMU was adopted by meetings and workshops with all staff and student groups invited. A participatory approach was believed to engender greater involvement and ownership and would contribute to a better quality output. It was recognized that this may also require a greater effort in terms of time and resources but that this was worthwhile.

In practice, a managed participatory approach had been adopted, with stakeholder consultation built into the planning and development process. In terms of early consultation, a range of methods had been used including informal soundings, suggestions made via a university forum and various supportive background documents and presentations being widely circulated in advance of the workshop. It was expected that as more stakeholders become engaged in this preliminary stage, further stakeholder-based background documentation would be developed and that a wide and inclusive brief defining the scope and extent of stakeholder involvement through the participatory process would emerge.

Community Engagement

Since the start of the 21st century, the enduring problem of sustainable development has attracted the serious attention of all nations and peoples (Hernández Arámburo et al., 2017). In this quest, higher education institutions, particularly universities acting as centres for knowledge generation and transfer, are expected to play world-leading roles. However, despite a world consensus that sustainable development must be achieved in the immediate future, with the sustainable development goals setting the timeline, the dream remains unfulfilled (Michael Hanline, 2019). With universities typically insulated and operating within well-defined institutional, cultural, and academic boxes, being ahistorical institutions, they are deemed slow and docile to change, hence becoming yesterday’s star. For many years, education has been accepted as a fundamental right, a means for social and economic equity, and a basis for sustainable

human development at local, national, and global levels. Education for sustainable development has been viewed as a pioneering movement since the Declaration at the 2005 Conference at Bonn. Restructuring curricula for sustainable development has largely been a path-dependent effort that takes stock of previous initiatives whilst anticipating what should be accomplished.

Sustainable community engagement in higher education is paramount to achieving broader sustainable development goals. Community engagement is fundamental to fostering university social responsibility and responding effectively to the socio-environmental needs of present and future generations. However, community engagement at universities is rare, often limited to local interventions by volunteer faculty and students. Engagement efforts tend to be fragmentary, with many academics feeling overwhelmed by consultancy demands. These issues resonate with and are expressed during the six months of delay in reporting five university leaders undertaking community engagement. Defining effective strategies for social relevance and accountability in academia remains imperative. If universities cannot genuinely engage with surrounding communities, they run the risk of becoming normative spaces like courthouses or airports – grandiose images disconnected from the daily lives of people. In light of recent global developments, including the COVID-19 pandemic, aberrant weather events, water shortages, forced migration, population displacements, escalating violence, local and global food crises, and even rampant extremism, the need for sustainable community engagement now looms larger than ever.

Case Studies of Successful Initiatives

Despite the ever-growing importance of sustainable development (SD), achieving this goal in practice has remained elusive, especially within academic institutions. New 21st century challenges, such as waste management and climate change, require proactive and efficient approaches at all levels of society. The higher education institutions (HEIs) sector is a key and crucial component of society as it provides knowledge and resources that are supposed to solve these problems. This contribution starts with a description of the education for sustainable development (ESD) challenges that HEIs still face a decade after the 2012 United Nations Conference on Sustainable Development in Brazil. Then, recent findings from two empirical projects are presented. ESD initiatives from 55 institutions globally illustrate diverse approaches, obstacles, and opportunities to promote ESD in HEIs (Volkova et al., 2019). Additionally, the case of Ural Federal University (Ufu) presents distinctive features and successful initiatives from one of the largest Russian universities.

Around the world, academic institutions are attempting to incorporate various aspects of sustainability into their everyday life by proposing alternative pedagogical approaches and new curricula and collaborating with other higher education institutions

(HEIs). There are, however, still a fair number of barriers that hinder the implementation of a full-fledged SD agenda in those institutions. For example, proactive mechanisms of sustainability curricular integration in research enable a better understanding of the disciplines that are applicable and of interest to the university community; existing pedagogical approaches, though acknowledged as the most successful, must be adapted and further refined; and mechanisms for practical application and considerations of sustainable development must be developed to foster closer ties between science and sustainable development (Leal Filho et al., 2017).

University A: Renewable Energy Projects

The University A boasts a progressive stance towards sustainability. Its administration has made it an organizational goal to put into practice the principles of sustainable development through both institutional transformation and education (Leal Filho et al., 2023). The university's sustainability initiatives have two key areas: renewable energy projects and widespread social outreach initiatives. This section focuses on the university's photovoltaic solar energy project and its wind energy project.

In 2014, University A installed a photovoltaic solar energy facility in Sao Paulo, Brazil, as part of a bid to reduce costs and carbon emissions. This facility has sometimes produced excess energy, which the university sells to energy companies. The establishment of the facility was well-publicized and acknowledged as a positive initiative, although there were some complaints. Several years later, 27% of solar energy production was sold to the local energy company, while the remaining 73% was used to meet the university's energy demands. The energy crisis has increased public awareness of energy-related issues, bringing about changes in policy and social behavior.

In 2019, the university started a wind energy project in Ceara, Brazil. Of the energy produced by the wind plants, 50% was allocated to the Brazilian Educational Telecommunication & Broadcasting network, and the remaining energy was sent to the public grid. However, due to delays in the energy purchase, the university has lost significant amounts of funds during this period. Completion of the plant is expected next year. Research suggests that it is feasible to develop technologies that use energy more efficiently in order to ease investments. It also highlights the need for efforts to change infrastructural barriers and social and environmental justice struggles at the level of governance. Testimonials claim that decreasing carbon emissions and increasing the use of renewable energy can affordably limit climate change impacts if universities invest in the changes to global energy systems.

University B: Waste Reduction Programs

The University B's overall waste production and waste diversion rates will be evaluated by gathering waste composition sample data in order to gain a full understanding of the

campus waste stream. Surveys will also be conducted to gauge the student body's thoughts on sustainability initiatives and waste management at the University . Throughout the process, the need for a campus-wide composting system will also be promoted to help decrease overall waste production sent to the landfill and to educate students on the importance of composting as a way of waste diversion. Waste reduction programs and initiatives, such as composting and reusable programs, have and can provide significant positive impacts on college campuses (Sean Curtin et al., 2018). These positive impacts could include campus-wide waste reduction, higher recycling and composting rates, and lower costs on disposables.

The success of any waste management initiative is to mitigate the environmental and economic pressures faced by the institution. Campuses need to take charge in the effort to minimize waste production and to optimize waste management. In doing so, waste reduction programs, especially composting and reusable programs, could be examined and encouraged on the campus. Furthermore, colleges and universities have the opportunity to engage and educate the student body, faculty, and staff on sustainability and other important issues. This concept could be translated to many actions, initiatives, and programs, which each college would have to decide on individually in order to best meet their mission and vision. However, the need for immediate action is true for any campus around the country, as the national waste problem continues to grow in size and scope.

University C: Sustainable Transportation Solutions

University C is taking several important steps to improve sustainability on its campus. These initiatives include enhanced public transportation services to ease connections with the region, improved information on the campus website to help users understand these options better, and educational activities targeting student motorists (Sangree et al., 2014). One major action in this area is the collaboration with a city bus provider to facilitate expanded bus service with university subsidies. Expanded direct service on the existing routes to nearby suburban neighborhoods is also underway. After this service has been stabilized, governments might be persuaded to increase bus service to the unpopulated areas northeast of the campus and to the significant riding centers south and east of campus. A nearby park-and-ride facility may also be developed. This might encourage the prohibition of on-street parking permits for neighborhood residents in areas close to the university. It is crucial to make sure that some of these initiatives don't lead to the creation of new environmental problems or to an unexpected increase in the number of automobiles on campus. With the aim of allaying such concerns, two important steps have been taken, including better signage to provide advance notice when the parking lots are full and an information upgrade expanding the campus transit web page. Picking up students and their belongings as they move in is an opportunity for communication in a non-confrontational climate. A package

containing good food, drinks, snacks, and meat alternatives has been arranged, with the latter buoying hopes for new vegetarians and vegans ahead of dietary changes (Withycombe Keeler et al., 2018). “Goodie bags” serving the same goal are being turned into presents for new conservation-minded dorms. All of these strategies, many of which have been short in duration, are preliminary, experimental attempts aimed at changing the behavior of a relatively small group at first, with the intention of scaling up those that work as the need arises.

Policy Frameworks Supporting Sustainability

A detailed analysis is carried out on the policy frameworks supporting sustainability in universities. As finding solutions to the current environmental crisis requires substantial changes in social behavior and action, higher education institutions (HEIs) are increasingly called upon to lead and facilitate this change. Higher education for sustainable development (HESD) requires educational institutions, especially universities, to adopt sustainability into their teaching, research, outreach and management. The insights could provide meaningful guidance for universities striving for sustainability worldwide. The findings generally align with the academic literature on HESD, but there are also some unique Chinese characteristics. Integrated approaches and professional schemes for inclusion of sustainability in higher education tend to be more widely accepted in China than in the academic literature. Despite the increased national and institutional efforts to embed sustainability into universities, policy integration issues still remain unclear in the academic field.

Inconsistencies were indicated in national leadership, supporting initiatives, internal policies and hierarchical expectations. These inconsistencies could be addressed by bottom up policy development based on national and organizational policy frameworks. Collaboration, partnership, education, outreach, teaching and learning, staff development, curriculum review, research, campus and operations and policy are the policy issues that could support implementation. On the contrary, advocacy as a policy issue can hinder implementation. Achieving consistency of relevant policy issues could enhance sustainable development implementation in higher education institutions. Indicators for evaluation of implementation might be complementary, but more empirical evidence should be collected regarding their effectiveness. The policy issues list defined in this paper provides a helpful tool to decide both the scope and attention to sustainable development in terms of policy development and practice in higher education. This paper provides a starting point regarding vertical policy integration and related implications (Ruiz Vargas et al., 2019).

National Policies

In countries with a mature tradition of sustainable development in HEIs and where SD policies at national and organizational level are also more perfect, regulations played a

facilitating role to a higher extent. However, this only modality was found in Switzerland, Japan, Finland and Estonia in lower degree-diagonal circumstance. This finding alluded to the assumption that better balances of national and HEIs policies regarding SD were generally sought in more mature countries- with this contributing to the facilitation of SD in HEIs. However, such combination was not extensive, while in other countries, the mismatch of policy discourses and perceptions across levels were more prominent (Ruiz Vargas et al., 2019). In these countries, policies at national and organizational levels were complementary, at least discursively. Overall, a divergence existed regarding the perception of policies to SD in education that was brought to fore when the policies were scrutinized to a deeper level. Meanwhile, differences were also perceived between countries in this regard. In countries with high maturity regarding SD in HEIs, SD was regarded to be well integrated in the HE curricula in colleges; however, in developing countries, such as China and Kazakhstan, SD was interpreted to be integrated in a rather fragmented manner, more focusing on the single courses. The incompatibility of the policy matters and discourses of SD at national and organizational levels hinders to a large extent the more effective implementation of such policies (Leal Filho et al., 2017). Inputs regarding pursuing this aim were mainly highlighted especially in the less mature circumstance: the consistency of relevant policy issues and discourses could enhance sustainable development implementation in higher education institutions. The policy items that needed attention regarding inputs at HEIs regarding SD were revealed including staff transfer and exchange, auditing and reporting of policies, benchmarks and targets, research, monitoring, curriculum review and conception, partnership, campus and operations, information sharing and analysis, joint research and contests.

International Agreements

The Role of Multinational Obligations as an Influence Strategy on Transnational Discussion and Advocacy Networks—The Case of the Climate Change Agreements, discusses how multinational obligations and different transnational conditions support the formation of transnational information and advocacy networks targeting non-state actors in global climate change negotiations. In addition, it theorizes and analyzes the conditions under which multinational obligations might be an influence strategy on transnational discussion networks among non-state actors, and large coalitions with mutual ties especially. Furthermore, it discusses the moral and electoral conviction as the transnational advocacy network conditions under which countries would enact multinational obligations to influence others. This study provides insights on the ability privilege and strategy of transnational discussion networks among non-state actors, and their relation with multinational obligations and transnational advocacy dissatisfaction with others. The Global Decisions from the Conference of the Parties to the UNFCCC in Cancun aims to address a huge gap in funding for climate change adaptation and mitigation activities in developing nations, up to US\$100 billion per year by 2020 as a

part of peak climate change funding commitments (Leal Filho et al., 2017). In addition, numerous initiatives were put in place to champion decision making processes regarding Green Climate Fund resources and mobilization strategies to fulfill these pledges, if needed by other parties, on the part of non-state actors, notably in civil society and businesses. However, no specific and robust decisions were made in Doha on how to finance climate change adaptation and mitigation actions.

Role of Stakeholders in Sustainable Development

All the main stakeholders within universities (e.g. students, researchers and decision-makers) were found to consider themselves responsible for incorporating sustainable development into universities. At the same time, other groups such as institutions and enterprises are perceived to have a lower chance of impacting decision-making. General activism and interest groups were mentioned, but to a much lesser extent. The stakeholders were asked to rate on an 11-point scale their perceived ability to affect (influence) the decision processes for sustainable development at their respective universities. On a general level, the most influential stakeholder group was perceived to be researchers (very high score, mean 9.25). Decision-makers (very high score, mean 8.31) and students (high score, mean 7.82) were also seen to be quite influential stakeholders. In previous studies, it was found that within universities, decision-makers are seen as the most influential group (Leal Filho et al., 2017). To some extent, this would follow similar patterns to those resulting from the general perceived ability to influence decision processes at universities. In contrast to this perception, institutions (e.g. national ministries) were rated the least influential, with a mean score of 5.11. When considering stakeholders indirectly related to universities, general activism and interest groups were the least effective groups in attempting to influence decision-making (Filho et al., 2019). In relation to other stakeholder groups, it should be noted that students and other activists have been shown to exercise pressure on universities to adopt a more proactive stance towards sustainable development, in order to cope with current sustainability challenges. At least in the eyes of the students, the universities should acknowledge this pressure and try to incorporate sustainable development in educating future engineers. Thus, student groups' efforts to influence decision-making processes at universities should be acknowledged, and their inclusion in decision-making could increase the trust of current and future students in the engineering education. The lower ability to affect decision-making may also be due to the nearness to power, in the sense that students, as perceived end-users, lack understanding of the decision-making processes. Thus, a gap of knowledge exists between students and decision-makers, and education on these aspects might help close the gap and increase students' ability to affect decision-making.

Faculty and Staff Engagement

The establishment of initiatives to promote sustainability among teaching and administrative staff requires their coordinated involvement in Multi-Perspective Teams (MPT). This team needs to cover all management levels, including university administration, faculty subdivisions or departments, and operational units (Leal Filho et al., 2017). Higher education institutions must primarily engage with faculty and staff from the environmental sciences, energy systems engineering, engineering physics, and architecture disciplines to feed into the target metrics for sustainability development. This is complemented by including faculty from various sustainability science and ecology disciplines in the early stages of the process. Faculty with elements of higher education accreditation and quality assessments, institutional evaluations, societal engagement, and stakeholder engagement with alumni and employers should also be included. Finally, participation of administrative and support staff with roles in sustainability performance indicators, administrative functions, and governmental reporting is crucial.

The MPT is modeled on collaborative eligibility approaches to European and international funding schemes in the domain of energy efficiency. MPTs must be composed of diverse stakeholders from research institutions, universities, public authorities, industry, and civil society. These groups must be configured in a highly customizable way to tackle the crucial challenges of the given institution, aligning competence profiles and available resources with MPT design. The initial steps in the adaptation of the MPT model to support standards-compliant transitions towards sustainability at higher education institutions depend on different factors.

In addition to objectives for convergence towards compliance with the SDG goals, implementation of pre-conditions, and explicit target indicators for quality systems, universities should actively provide pathways to compliance with systemic, organizational development, quality management, stakeholder engagement and knowledge generation and dissemination. Accompanying a higher education institution towards compliance with international and thematic priorities in science, stakeholder engagement beyond governmental agendas and institutional requirements, and intersectional, disciplinary, and integration approaches to sustainability in education aimed at the generation of profound partnerships between universities and with research institutions and administrative stakeholders can help to reach SDG goals by 2030.

Student Involvement

In order to raise awareness of the importance of sustainable development within universities, it is essential to actively involve students in projects numerous educational institutions focus on promoting sustainability. Based on approaches used in teaching

Self-Management by coaching star athletes as well as supporting conscious idea and knowledge exchange in student initiatives with shared interests in Sustainability, seven points that can be used to co-design and implement sustainability in education in universities are introduced.

At the very beginning, a small core group of committed students should be found to explore initial ideas and identify supporters from the university's leadership, among professors, and in the administration. Students should then be asked to compose a motivational letter indicating their interest and willingness to engage in this task, present a group of ten students with the diversity and necessary skills and competencies to represent the student body, and share their motivation letter and ideas in a short video clip to be shown during a public meeting with university leaders. Collaboratively designing visions for sustainability, in alignment with existing university missions and visions, helps deepen knowledge and consensus on sustainability and facilitates the appreciation of different perceptions and opinions. A set of possible design ideas that could be implemented gradually should then be presented in a subsequent public meeting, inviting all representatives of the university in attendance to decide on three topics on which they then want to work towards becoming a beacon. Each design topic should involve committed and interested people dissolving into smaller working groups looking into, discussing, and proposing the next actions to be taken (get things rolling) (Leal Filho et al., 2017). A few core rules for this process should be defined in order to allow for creative yet regulated and efficient working sessions in the working groups. Some of the thoughts could precede the work on the design topics.

One or two representatives knowledgeable about the original intentions of this whole process, about sustainability in society in general and at universities in particular, should guide each working group during the first few meetings, handing them the freedom to organize their process and the topics discussed themselves with their creativity and ideas, enriching the process with their insights and background knowledge where needed to keep it on track. Respecting the knowledge opportunity on the subject, groups working on the most innovative topics could be supported with literature sources and/or partnerships with companies/organizations/individuals outside the university with expertise on the topic, supporting them in the implementation of their ideas. At times, it is also advisable to take a step back and address in plenaries potential hurdles the design processes are facing, dealing with frustration, resistance, or the unwillingness to change.

Alumni Contributions

Education lends individuals social power through effective networking and, in turn, the ability to impact local communities through employment, funding, and opportunity creation. Once alumni exit the university, there is potential for providing current

students and departments with such social power if they are actively engaged throughout their education and understand the importance of giving back (Schutter, 2019). On the other hand, if alumni feel neglected or poorly treated by their campus experience, they are less likely to give back or, worse, may leave negative impressions of their institution. Leaving such impressions is detrimental because most future students start their college search from within their school and retain nearly 100% of the outreach and social media. While higher education institutions are not in a position to control such perceptions, they can create opportunities for students to expand peer networks socially, academically, and professionally.

Future fundraisers cannot control or predict the choices of past students, but contributing to a positive experience or fostering a community of support can yield dividends when alumni leave. Efforts to be social and involved on a contemporaneous basis create a better avenue for soliciting donations post-graduation (H. Bennett, 2016). Keep alumni engaged in their current departments through programming that is meaningful to them. Alumni can then provide value as contributors in a community for the next generation, have their voice heard in programming decisions, be active donors, and provide other valuable life skills within the department. Needed are more interactive measures to show students the importance of giving back. By engaging alumni, they can be given the opportunity to invest back into programs, organizations, and departments that helped them grow personally and professionally.

Ongoing interactions will create that network effect at the institution level, generating a cycle of impact with investments benefiting the current students while also instilling a culture of support that will inspire the current students to continue giving back as alumni. An engaged participant base can be solicited in multiple capacities: as donors of their time through mentoring, presentations, or programming; or via discretionary gifts with intentional impact. When the future alumni exit school and enter the professional world, and if they are either engaged and invested throughout their time at school, they will also be much more inclined to give back as successful, generous alumni.

Measuring Success in Sustainability Efforts

Publicly available information was compiled about a large number of university sustainability programs and sustainability-related initiatives. This information was analyzed to compare with the assessment indicators. The final assessment indicators, adaptation implementation plan, and two case studies are described. Based on the assessment process, the results provide insight on how to better measure efficiency and effectiveness of sustainability efforts on campuses. The indicator design makes it easier to adapt sustainability assessments for different universities. Following is an

introduction and backgrounds of the current national and international sustainability assessment efforts.

Across the United States and around the globe, a growing concern about important environmental and social issues has resulted in a broad array of actions and programs by universities to become more sustainable. Publicly available information was compiled about a large number of university sustainability programs and sustainability-related initiatives. This information was analyzed to compare with the assessment indicators. Indicator design and the assessment process are important efforts to track progress toward, and measure, universities' sustainability-related goals and commitments. Issues confronted, such as key components of sustainability, indicator accumulation, and how to improve the quantitiveness of indicators, were reviewed. The final assessment indicators were found to be useful and adaptable for evaluating university sustainability efforts. Further studies would enhance the efficacy and effectiveness of the assessment process.

Under the current frameworks of sustainability assessment development, implementation, and reporting, assessment processes that facilitate participation of internal stakeholders are the focus. It would improve insights on sustainability from non-university groups, such as local communities and NGOs. There are limitations in objective indicator design regarding objectivity and data collection in measuring indirect impact on local communities. It might be very hard to quantify this kind of measurement properly and efficiently. The necessary information sharing with local communities and the public is also one of the efforts to endeavor to make the educational efforts transparent and accessible. Sustainability assessment has undergone foundational visions and preliminary evaluations to diagnose performance related to sustainability initiatives.

This assessment enables campus personnel to create strategies to further strengthen sustainability across campus. Each routinely assessed indicator will be improved and adapted to capture a wider and deeper net of strategies and actions for campus sustainability. New projects will necessitate the development of additional indicators.

Key Performance Indicators

Recent adoption of sustainability-related reporting systems in universities is a welcomed development, but application of additional indicators addressing research about sustainability also seems necessary for meaningful monitoring of the sustainability contribution of universities to the 2045 agenda. Internationalized frameworks addressing stakeholder demands for universities' social responsibility have been proposed for other domains. Such frameworks of sustainability-related indicators engaging global stakeholder expectations for research about sustainability should be developed globally as well (Horan & O'Regan, 2021). Stakeholder demands

regarding sustainability have grown in recent years. Global stakeholder demands to a more sustainable higher education sector similar to earlier internationalized sustainability reporting standards existing for the industry could also be useful for improving monitoring of university contributions to sustainability.

Sustainability-related reporting of universities has increased significantly recently. There currently are three relatively established initiatives concerned with public reporting of the sustainability contribution of universities. While on the one hand this enhanced public accountability about how institutions are acting with regards to sustainability and transparency about their sustainability is a welcomed development in the sector which could boost more awareness about sustainability and actions taken, on the other hand there are significant concerns. These have to do with what is really getting covered in the reporting or what indicators are used. An analysis of the indicated sustainability-related indicators by three major initiatives addressing sustainability in higher education and the resulting key performance indicator (KPI) metrics that could serve as benchmark measure for meaningful and practical monitoring of the contribution of universities to sustainability is put forward. Proposed are eight KPIs concerning indicators for encouraging the contribution of universities to sustainability through research about sustainability as a necessary endeavor before assessment of performance for relevant global initiatives.

Further analysis of the applicability of the concerned indicators of research about sustainability for assessment of performance toward sustainability are discussed. Internationalized frameworks of reporting systems on performance of universities in developing global stakeholder demands for sustainability research are called for. In recent years similar demands for more sustainable operations and societal roles by the world's higher education institutions have been voiced by a variety of stakeholders. Demand for consideration of sustainability by universities in relevant academic roles could express itself through calls for meaningful transparency and accountability on these matters via reporting of performance.

Assessment Tools and Techniques

As the interest in campus sustainability continues to rise among higher education stakeholders, there is a need for tools and techniques to evaluate the indicators of sustainability and development on campuses. The authors acknowledge the fact that a perfect sustainability assessment tool might not exist, and suggest that different institutions should consider different assessment frameworks depending on their needs, challenges, and priorities. Campus sustainability research is considered as an intricate issue. There are many indicators and dimensions to consider for campus sustainability assessment but dealing with them requires adequate concrete methodologies and systems.

Research on campus sustainability measurement framework appears to be a relevant sector to be studied (Dawodu et al., 2022). By analyzing existing frameworks, a bigger picture of how to approach the concept of campus sustainability assessment can be highlighted. The impact of sustainability evaluation on university sustainability would be tricky to assess, because long-term impacts may not yet have arisen, but the attitudes and intentions of university constituents may be analyzed in more concrete terms. There is a growing need for academia to deeply assess their sustainability and sustainability efforts. At Union College, in 2011, a sustainability assessment tool for higher education institutions called Sustainability Tracking, Assessment, & Rating System (STARS) was developed to effectively develop and assess sustainability. The tool allows an opportunity for participants to assess their universities' sustainability performance based on a comprehensive evaluation management framework comprised of over a hundred indicators (William Woods et al., 2018).

Higher education sustainability assessment is a young but growing area. In two years after the green building movement, the first higher education sustainability assessment tool was developed by the development group of Sustainable Endowments. "The Princeton Review's Green Rating" aimed to evaluate and assign ratings to colleges and universities based on their sustainability performance by developing some indicators including institutional commitment and plans, grounds and building objectives, energy consumption and saving efforts, recycling, and procurement efforts. Subsequently, several other assessment tools emerged. The list of most commonly used assessment tools contains the Chinese version of STARS, Green Campus Evaluation System, Sustainability Assessment Framework for Higher Education Institutions, Sustainability Assessment in Higher Education, Sustainability Assessment and Performance Evaluation Tools for Universities, Sustainability Assessment and Rating Guides for Universities, and Sustainability Indicator Portfolio for Campuses.

Future Directions for Sustainable Development in Universities

The Top 10 Grand Challenges for Universities encompass human challenges, natural system challenges, and technological challenges. Future directions for sustainable development in universities encompass educational challenges, engagement/collaboration challenges, and research challenges. These challenges pose great opportunities for universities to make unique contributions to the advancement of society.

Universities should seize the abundant opportunities to forge the future of sustainability with a spirit of adventure. They increase the odds for placements in the future world's best universities with a more entrepreneurial mindset and outsider perspective in forming alliances with various stakeholders. They employ sustainability as one of the

lenses for examining and identifying patterns and techniques employed by challengers, innovators and leaders in other sectors (Leal Filho et al., 2017). They synthesize the emergent opportunities to better seize them, further advance globally high-impact teaching and research, and ultimately cultivate an emerging generation of academics, faculties and citizens with boundless sustainability mindset in universities.

The inherent adaptability of sustainability challenges may also provide an opening to the more adventurous, risk-accepting side of organizations. The sustainability challenges give rise to a plethora of side effects that could also potentially serve as venues for more exploratory, experimental, and academic-themed endeavors. It is through providing and examining the wild cards and grand challenges in universities that congruently schooled scholars on sustainability mindset should learn to evolve new thinking and modes of stakeholder engagement to teach sustainability better.

Emerging Trends

Over the past decades, Totally 31 of 193, nearly 15%, Sustainable Development Goals (SDGs) relatively focused emerging and developing national economies and China's status, trends, strategies, and case studies have continuous approve and provided. The goal of this study is to present recently literatures review and meta-analysis researches, to observe crisis, opportunities, challenges, solutions, and developmental trends aim to provide comprehensive information reference, learning behavior and inspiration, further, is to improve its SWOC, sustainable valuable knowledge and services for universities related scholars. Global wide donned models mechanisms and orchestrators of separate and comparative analysis and systematic realistic evidences, also more than Cruis'black swan' widely agreed consequences, challenges and shortlist responses, development intervention strategies. Consequently, dynamic models of nine double edge great potential opportunities and constructive black elephant challenges, some practitioners' experience, knowledge sharing of cases should be selected and done carefully. Supporting by two validated and relevant instruments, the explorability, influential factors and out and input orientations of knowledge sharing and value creating behaviors about recent deepening ecological, economy and pandemic crises and challenges of 265 higher education universities there are clearly invoked.

Main arguments of these elaborated findings are that knowledge sharing including both orthogonal and oblique value creating and co noun shifting behaviors, to become sustainably effective, constructive and value co-an creating, relatively independence, supporting and driving responsibilities, mutually suggested, inquiring, knowledgeable and experience sharing, inter relational and discursive beliefs. All higher learning organizations, especially SDG17.65 encouraging, supporting and funding capacity building behaviors with focus on low effective knowledge co-noun service and procedural behaviors should be implement and serve learners, societies and places. Full

commission, separately and comparative macro and micro instruments validation coefficient and item should be transformed, reviewed and appropriately improved. Knowledge creating, sharing and spreading in designated, diverse and timetabled platforms evidence based actionable items, mutually better and practically jointly consulted in knowledge sharing and co-creating indicators with any related universities and organizations, especially broaden soughtment on idea credibility and selection policies in co-creation prior ethical code of conducts of knowledge sharing and commenting behaviors, quantitatively and qualitatively advances and undersigning knowledge sharing and supporting contracts between providers and users (Leal Filho et al., 2017).

Innovative Practices

Higher Education Institutions (HEIs) have important roles in providing training and research in sustainability. The incorporation of sustainability in these institutions is still a work in progress, and numerous challenges need to be overcome in the future (Leal Filho et al., 2017). The aim of this study is to analyze some of the fundamental obstacles to the incorporation of Sustainable Development (SD) in universities. An empirical study is presented, and HEIs across the world participated in a questionnaire that aimed at identifying problems that hindered education for sustainable development.

The issues to be considered in this paper stemmed from a previous literature review and focused on the issues of education and curricula, research, facilities/campus operations, community outreach, and monitoring progress. Some countries had quite few responses. Therefore, to gather a good response rate, it was decided to gather these countries under the label “others”. This group of other countries included Bahrain, Bulgaria, Czech Republic, Egypt, Ghana, Luxembourg, Oman, Puerto Rico, Qatar, South Korea, Turkey, and Yemen.

Four main issues are included in the education and curricula item: (i) knowledge on sustainable development is not incorporated in the curricula of the courses offered; (ii) teaching on sustainability is a good balance between theory and real practice; (iii) traditional teaching methods are a barrier to sustainable development education; (iv) the SD content is in a compulsory subject or a selection of disciplines. It must be highlighted that to make students aware of policies of sustainability, it is essential that they have knowledge on sustainable development. Moreover, for more effective learning there should be a balance between theory (lectures) and real practice (research, practice in the laboratories, extra classes), as well as a compatible teaching method with the degree of knowledge of the student.

Conclusion

This paper assesses the role of planning and possible strategies for improving the incorporation of sustainable development in a Higher Education Institution (HEI). It presents an active HEI as a case study, focusing on challenges regarding the institution's incorporation of sustainable development into its institutional framework, ICT services, teaching, and building design. In the long run, the research aims to improve the understanding of possible implementation schemes worldwide and the contribution of planning towards these. Planning is found to hold a fundamental role regarding the realization of the HEI's goal of becoming an engaged institution in the field of sustainability. Various steps to the effective incorporation of planning at this institution are suggested, recognizing that the process is still ongoing and that additional strategies might emerge subsequently. Contributions to the body of research on the role of planning in embedding sustainable development in HEIs are proposed, specifically with regard to concrete strategies for implementation and consideration of the role of barriers and incentives in the process (Filho et al., 2019). In a rapidly changing world characterized by uncertainty, HEIs are faced with social demands for an increased focus on sustainability, in curriculum, research, and campus functioning. Following a threat/sustaining processes approach from the field of strategic management, this paper analyses aspects that constrain, prohibit, or discourage HEIs in embedding sustainability in their institutional frameworks and functioning. An exploratory, qualitative case study focusing on the HEI's handling of curriculum aspects is presented, including documentary analysis and semi-structured interviews. Several barriers are identified, ranging from lack of leadership and strategic vision to structural and historical aspects of degree programs, practices, and departmental cultures. Suggestions to overcome the identified barriers are made. The paper also outlines how a better understanding of the sustainability-oriented change process can be supported through research on the nature, interrelations, persistence, and change of barriers and incentives (Leal Filho et al., 2017).

References:

Leal Filho, W., Wu, Y. C. J., Brandli, L. L., Avila, L. V., Azeiteiro, U. M., Caeiro, S., & da Rosa Gama Madruga, L. R. (2017). Identifying and overcoming obstacles to the implementation of sustainable development at universities. [\[PDF\]](#)

Filho, W. L., Skanavis, C., Kounani, A., Brandli, L. L., Shiel, C., Paco, A., Pace, P., Mifsud, M., Beynagi, A., Price, E., Salvia, A., Will, M., & Shulla, K. (2019). The Role of Planning in Implementing Sustainable Development in a Higher Education Context. [\[PDF\]](#)

Abo-Khalil, A. G. (2024). Integrating sustainability into higher education challenges and opportunities for universities worldwide. [Heliyon. cell.com](https://www.heliyon.com)

de Villiers, C., Dimes, R., & Molinari, M. (2025). Determinants, mechanisms and consequences of UN SDGs reporting by universities: conceptual framework and avenues for future research. *Journal of Public Budgeting, Accounting & Financial Management*, 37(2), 329-349. up.ac.za

Tien, N. H., Anh, D. T., Van Luong, M., Ngoc, N. M., Duc, L. D. M., & Dat, N. (2021). Sustainable development of higher education: A case of business universities in Vietnam. *Journal of human university natural sciences*, 47(12). jonuns.com

Kaiser, Z. R. M. A. (2023). Failing to attain sustainable development in Bangladesh: A potential comprehensive strategy for sustainability. *Sustainable Development*. researchgate.net

Berchin, I. I., de Aguiar Dutra, A. R., & Guerra, J. B. S. O. D. A. (2021). How do higher education institutions promote sustainable development? A literature review. *Sustainable Development*, 29(6), 1204-1222. [\[HTML\]](#)

Crawford, J. & Cifuentes-Faura, J. (2022). Sustainability in higher education during the COVID-19 pandemic: A systematic review. *Sustainability*. mdpi.com

Žalėnienė, I. & Pereira, P. (2021). Higher education for sustainability: A global perspective. *Geography and Sustainability*. sciencedirect.com

Mpofu-Hamadziripi, N., Rauch, F., & Dulle, M. (2022). Transforming curricula in higher education: description of two perspectives from the global south and the global north. *Frontiers in Education*. frontiersin.org

Krishnamurthy, R., & Sahay, G. (2023). Higher education for sustainable development goals: Bridging the global north and south. In *Higher Education for the Sustainable Development Goals: Bridging the Global North and South* (pp. 57-75). Emerald Publishing Limited. [\[HTML\]](#)

Javanmardi, E., Liu, S., & Xie, N. (2023). Exploring the challenges to sustainable development from the perspective of grey systems theory. *Systems*. mdpi.com

Berjawi, A. E. H., Walker, S. L., Patsios, C., & Hosseini, S. H. R. (2021). An evaluation framework for future integrated energy systems: A whole energy systems approach. *Renewable and Sustainable Energy Reviews*, 145, 111163. researchgate.net

Leal Filho, W., Simaens, A., Paço, A., Hernandez-Diaz, P. M., Vasconcelos, C. R., Fritzen, B., & Mac-Lean, C. (2023). Integrating the Sustainable Development Goals into the strategy of higher education institutions. *International Journal of Sustainable Development & World Ecology*, 30(5), 564-575. mmu.ac.uk

- Mokski, E., Leal Filho, W., Sehnem, S., & Andrade Guerra, J. B. S. O. D. (2023). Education for sustainable development in higher education institutions: an approach for effective interdisciplinarity. *International Journal of Sustainability in Higher Education*, 24(1), 96-117. mmu.ac.uk
- Mohamed Hashim, M. A., Tlemsani, I., & Duncan Matthews, R. (2022). A sustainable university: Digital transformation and beyond. *Education and Information Technologies*, 27(7), 8961-8996. springer.com
- Price, E. A. C., White, R. M., Mori, K., & Longhurst..., J. (2021). Supporting the role of universities in leading individual and societal transformation through education for sustainable development. ... *Sustainability*. springer.com
- Voulvoulis, N., Giakoumis, T., Hunt, C., Kioupi, V., Petrou, N., Souliotis, I., & Vaghela, C. J. G. E. C. (2022). Systems thinking as a paradigm shift for sustainability transformation. *Global Environmental Change*, 75, 102544. sciencedirect.com
- Joel Todowede, B. (2014). Financial Management for Sustainable Administration and Institution Building. [PDF]
- Singun, A. J. (2025). Unveiling the barriers to digital transformation in higher education institutions: a systematic literature review. *Discover Education*. springer.com
- Gardner, C. J., Thierry, A., Rowlandson, W., & Steinberger, J. K. (2021). From publications to public actions: the role of universities in facilitating academic advocacy and activism in the climate and ecological emergency. *Frontiers in Sustainability*, 2, 679019. frontiersin.org
- Yusuf, R. & Fajri, I. (2022). Differences in behavior, engagement and environmental knowledge on waste management for science and social students through the campus program. *Heliyon*. cell.com
- Leiva-Brondo, M., Lajara-Camilleri, N., Vidal-Meló, A., Atarés, A., & Lull, C. (2022). Spanish university students' awareness and perception of sustainable development goals and sustainability literacy. *Sustainability*, 14(8), 4552. mdpi.com
- Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising awareness on solid waste management through formal education for sustainability: A developing countries evidence review. *Recycling*. mdpi.com
- Becker, P. (2023). Sustainability science: Managing risk and resilience for sustainable development. [HTML]

Hajian, M. & Kashani, S. J. (2021). Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals. Sustainable resource management. [\[HTML\]](#)

Mondejar, M. E., Avtar, R., Diaz, H. L. B., Dubey, R. K., Esteban, J., Gómez-Morales, A., ... & Garcia-Segura, S. (2021). Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet. *Science of The Total Environment*, 794, 148539. [sciencedirect.com](https://www.sciencedirect.com)

Chatzitheodoridis, F., Melfou, K., Kontogeorgos, A., & Kalogiannidis, S. (2022). Exploring key aspects of an integrated sustainable urban development strategy in Greece: The case of Thessaloniki City. *Smart Cities*, 6(1), 19-39. [mdpi.com](https://www.mdpi.com)

Nikpour, M. & Pooladkhai, R. (2012). Review of Different Architectural Strategies for Creating Sustainable Universities. [\[PDF\]](#)

Rahmelia, S., Haloho, O., Pongoh, F. D., & Purwantoro, B. (2022). Building an Environment That Motivates Education Sustainability in Tumbang Habaon Village, Gunung Mas, Central Kalimantan Province, During Pandemic through Participatory Action Research between Parents, Schools and Church. *Engagement: Jurnal Pengabdian Kepada Masyarakat*, 6(1), 204-220. [fkdp.or.id](https://www.fkdp.or.id)

Alimron, A., Syarnubi, S., & Maryamah, M. (2023). Character Education Model in Islamic Higher Education. *Al-Ishlah: Jurnal Pendidikan*, 15(3), 3334-3345. [staihubbulwathan.id](https://www.staihubbulwathan.id)

Leal Filho, W., Frankenberger, F., Salvia, A. L., Azeiteiro, U., Alves, F., Castro, P., ... & Ávila, L. V. (2021). A framework for the implementation of the Sustainable Development Goals in university programmes. *Journal of Cleaner Production*, 299, 126915. [bg.ac.rs](https://www.bg.ac.rs)

Aljuwaiber, A. (2024). Implementation of a strategic plan within a university college: a practical framework. *Perspectives: Policy and Practice in Higher Education*, 28(4), 173-182. [\[HTML\]](#)

Luo, G., Xiao, L., Liao, G., Luo, S., Shao, R., Zhou, J., ... & Wu, J. (2022, June). Multi-level reservoir identification with logs based on machine learning. In *SPWLA Annual Logging Symposium* (p. D051S022R003). SPWLA. [\[HTML\]](#)

Zheng, Z., Mohammadi, A., Zhang, X., Shi, W., & Rusch, L. A. (2023). Pushing capacity limits with multi-segment SiP modulators. *Journal of Lightwave Technology*, 41(19), 6176-6186. [\[HTML\]](#)

Gregory Jesus Coffie, R. (2005). Toward a greener campus : experiments with sustainable resource management at one Mexican university and two United States universities. [\[PDF\]](#)

Tinker, H. & Tzoulas, K. (2014). The Benefits and Challenges of Developing and Implementing an Environmental Management System Using a Participatory Approach: A Case Study of Manchester Metropolitan University, UK. [\[PDF\]](#)

Hernández Arámburo, R., Cruz González, H., & Ceja Rivas, A. (2017). University vinculación: A two-way strategy for sustainable development and academic relevance. [\[PDF\]](#)

Michael Hanline, A. (2019). University-Community Engagement Projects: Design to Empower Community. [\[PDF\]](#)

Volkova, M., Stoffers, J., & Kochetkov, D. (2019). Education Projects for Sustainable Development: Evidence from Ural Federal University. [\[PDF\]](#)

Leal Filho, W., Guedes Vidal, D., Alzira Pimenta Dinis, M., Lambrechts, W., R. P. Vasconcelos, C., Molthan-Hill, P., Rimi Abubakar, I., M. Dunk, R., Lange Salvia, A., & Sharifi, A. (2023). Low carbon futures: assessing the status of decarbonisation efforts at universities within a 2050 perspective. ncbi.nlm.nih.gov

Sean Curtin, J., Robert Mooney, S., & J Peccerillo, S. (2018). Waste Reduction Through A Reusable Container Program. [\[PDF\]](#)

Sangree, A., Colón, A., & Coleman, B. (2014). Promoting Sustainability to First-Year Students. [\[PDF\]](#)

Withycombe Keeler, L., Beaudoin, F., M. Lerner, A., John, B., Beecroft, R., Tamm, K., Wiek, A., & J. Lang, D. (2018). Transferring Sustainability Solutions across Contexts through City–University Partnerships. [\[PDF\]](#)

Ruiz Vargas, V., Lawthom, R., Prowse, A., Randles, S., & Tzoulas, K. (2019). Implications of vertical policy integration for sustainable development implementation in higher education institutions. [\[PDF\]](#)

Schutter, E. (2019). Leaving a Legacy: Empowering Students to Give Back. [\[PDF\]](#)

H. Bennett, D. (2016). Marketing of education: The relationship between college student experiences and the desire to become a donor. [\[PDF\]](#)

Horan, W. & O'Regan, B. (2021). Developing a practical framework of sustainability indicators relevant to all higher education institutions to enable meaningful international rankings. [\[PDF\]](#)

Dawodu, A., Dai, H., Zou, T., Zhou, H., Lian, W., Oladejo, J., & Osebor, F. (2022). Campus sustainability research: indicators and dimensions to consider for the design and assessment of a sustainable campus. ncbi.nlm.nih.gov

William Woods, I., Hance Fennick, J., Michael Morgan, J., & John Kornacki, T. (2018). Implementing and Critiquing the Higher-Ed. Sustainability Evaluation Tool. [\[PDF\]](#)