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Sustainable Design Approaches Towards Green Higher Education Campus

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ABSTRACT

The primary goal of our work is to address the issues concerning the application of sustainability concepts in the Higher Education Campus of the Faculty of Architecture at Universidade de Lisboa. Sustainable actions and attitudes are part of the sustainable principles of the Sustainable Development Goals adopted in the 2030 Agenda by all member states of the United Nations. This exploratory research is based on a review of the international literature specialized in sustainability assessment in Higher Education Institutions. A qualitative research approach was applied, using a questionnaire adapted from the European University Association in 2021, as a research instrument, with the objective of knowing the perception and opinion of the Faculty of Architecture (FA) academic community on some of the collective actions of greening. Based on a survey carried out on a non-probabilistic sample selected from Campus users, a qualitative interpretation and discussion of the data obtained were performed. With this investigation, we intend to know the challenges and initiatives practiced in this Campus in defense of sustainability and contribute towards a changeover the environmental, social, and economic awareness of the campus community.

Keywords: Design, Sustainability-IES, University Campus - Faculty of Architecture, University of Lisbon, Greening

INTRODUCTION

Human the increase in the awareness of sustainability is strongly reflected in education, particularly in Higher Education Institutions (HEIs), which, by their participation in the formation of future citizens endowed with a critical and intervening conscience, both in the complex effects of decision making and in the effects of their practices and behavior, play a fundamental role in the construction of a sustainable society.

The issue of sustainability in Education Campuses can be observed from two points of view, which, in the end, culminates in a dynamic of defining the paths to sustainability in these institutions. On the one hand, we have the training of students who can contribute to the training of future professionals who, aware of the principles of sustainability, can act and apply these principles in their actions with society. They are well placed to play a key role in achieving the objectives of the UN SDGs, the Agenda 2030 and the European Green Deal. In 2002 Zitzke called for the education of citizens

who are informed about their socio-environmental reality, starting with the acquisition of knowledge and skills in this area, expanding environmental programs, promoting research and the development of interdisciplinary projects, so that together they can think and act in coherence with a sustainable future.

As supported by some authors (Lambrechts et al., 2013; Rieckmann, 2012; Godemann, 2011; Lang et al., 2012), it is up to each institution to guide teaching and learning towards inter and transdisciplinary work, participating in the search for solutions to deal with the problems and challenges posed by sustainable development, opening new perspectives on the relationship with nature, consumption patterns, and with different cultures. On the other hand, the implementation of measures and practices supported by the Sustainable Development Goals, can be understood as models of small urban centers, involving practices associated with the management of the three dimensions of environmental, social and economic sustainability, namely in teaching, research and extension activities, as well as activities at the level of sustainable management of material resources in the various spaces and structures - bars, restaurants, libraries, leisure spaces, green spaces, as well as all the basic infrastructure networks, such as water supply networks, energy, telecommunications, IT, sanitation, storm water, access roads, among others. With a focus on education for sustainability, higher education institutions can take a leadership position and be an example to society, both in educating their students and in raising public awareness of sustainability "Higher education institutions have a deep moral responsibility to raise the awareness, knowledge, skills, and values needed to create a just and sustainable future." Higher education plays a critical, but often neglected, role in making this vision a reality. It prepares most of the professionals who develop, lead, manage, teach, work in, and influence the institutions of society (Cortese, 2003, p. 17). Higher Education Institutions are, therefore, a privileged place for education towards sustainable development, which implies a change of attitude, in the sense of rethinking the relationship of Man with nature and with himself, in the construction of a promising future (Agenda 21, 2003).

EDUCATION AND SUSTAINABILITY

Worldwide there is a solid political commitment to integrating education for sustainable development (Wals, 2012), that can be understood as "a process of learning how to make decisions that consider the long-term future of the economy, ecology and equity of all communities" (UNESCO, 2005, p. 17).

The topic of the environment in HEIs emerged in the United States in the 1960s and 1970s oriented toward discussions of environmental management, extending into the 1980s with a focus on the more specific policies of waste management and energy efficiency. The issue of Education for Sustainability has put the evaluation of sustainability initiatives carried out in HEIs under great pressure, with the aim of determining policies, values and good practices that may give rise to conceptual models, inspiring sustainability

decisions in HEIs, in defense of a more sustainable world. "Higher education institutions are central to the green transition and to creating more sustainable societies," said Amanda Crowfoot (EUA, 2021). Starting in the 1990s, environmental policies of a more global scope began to be developed, bringing together the various dimensions of these institutions, as is the case of the Ecology Campus at the University of Wisconsin in Madison or Brown at Brown University in the United States (Delgado and Vélez, 2005). In effect, the role that HEIs can have in training responsible citizens, promoting the development of sustainable projects and practices based on the social, environmental and economic dimensions, has been highlighted by several authors (Cortese, 2003; Lozano, 2006; Karatzoglou, 2013), while these issues have been addressed in meetings and gatherings of world leaders, with the presentation of statements and commitments in defense of a better planet for all, at the level of "education, research, extension and maintenance" (Velazquez et al. , 2006, p. 811). The Agenda 21, whose document was prepared during the ECO-92 - United Nations Conference on Environment and Development - in the city of Rio de Janeiro, aimed at redefining the countries' development model, including the concept of education for sustainability. The proposals presented in this Agenda 21 emphasized the role of education in sustainable development and pointed out a new approach to teaching in universities, proposing a pact of attitudes and actions to achieve a sustainable development standard in environmental balance, social justice and economic efficiency for this 21st century. In Europe the previous year, the Copernicus Charter was signed in 1994, which constituted a European inter-university program of collective commitment to mobilize the resources of universities to promote sustainable development. It was established as an objective to make sustainability a reality in European research and teaching, stimulating the multidisciplinary integration of research projects and their dissemination. However, Leal Filho et al., (2017) found that most initiatives developed in HEIs were focused on education and some sustainable activities and practices applied to the campus, with research being the least explored area. In the evolution of the commitment of HEIs to sustainable development, one of the most recent milestones emerged with the 2030 Agenda published by the United Nations in September 2015. Entitled "Transforming our World: the 2030 Agenda for Sustainable Development", this document contains 17 Sustainable Development Goals and 169 targets to be met by signatory countries by 2030. This Summit assumes a special role in its proposals, which range from "Ending poverty and hunger; Tackling inequalities, empowering women and girls and leaving no one behind; Fostering sustainable economic growth, transformation and promoting sustainable consumption and production; Protecting our planet and combating climate change; Building effective, accountable and inclusive institutions; A strengthened global partnership for realizing the post-2015 development agenda (Agenda 2030, 2015). Despite the dominance from "environmental issues", the AGENDA's approach includes all aspects of life such as education, food, cities, industry, peace, gender and many others. So, has given us the chance to rethink the role of higher education institutions as exemplary structures both in their educational and social actions and as management and leadership models

in education for sustainability and in the development of projects and research associated with environmental, social and economic problems (Guni, 2019). Another guideline left in this statement refers to the need to frame the goals and objectives in a particular geography (both metaphorically and literally).

Dimension of IES's action is thus stabilized in the development of holistic actions and research, conditioned to a specific context and with regional approaches, making a priority the evaluation of initiatives directed towards sustainability in HEIs, in order to give rise to conceptual models, inspiring decisions about sustainability in defense of a more sustainable world. According to Sayed, A. et al (2013) these tools, based on indicators and conceptual models, could help to draw paths to find answers to the complex processes of the transformation for sustainability. In this sense, many studies and assessment tools for sustainability indicators in universities have been developed and tested around the world, including as main areas where these sustainability measures could be implemented "when well developed, these tools can be used as benchmarking practices, comparing HEI processes and performance metrics. (...) without necessarily putting them in a ranking or competition" (Caeiro et al., 2020, pp. 2,3). Bizerri (2018) warns of the need to individualize these processes of institutionalization of sustainability measures. Considered and made a systematic review to a set of Sustainability Assessment studies, published in different scientific reviews, with a different framework for the assessment of sustainability implementation in HEIs. These tools and their sources were selected and ranked for sustainability implementation assessment by the authors according to three well-defined criteria, including: a) assessment of performance of sustainability implementation; b) coverings at least two of the different dimensions of sustainability and its implementation; c) Covering at least two of the sustainability pillars to ensure a great overview of the problem and a realistic school campi approach. The authors' analysis focuses on a very broad universe of studies carried out on five continents, presenting an in-depth and representative study of the methods and indicators used internationally. Looking at the synthesis of these 27 tools carried out in HEIs, we could see that the great majority included in the sustainability evaluation the dimension of learning and teaching, as a transdisciplinary learning, experimental learning or research to understand various aspects of a complex phenomenon (Taylor, J, 2021) , as well as all the management and leadership measures and policies. The environmental management dimension was also considered by almost all the institutions, assuming different forms of approach, from the more generic to the more specific issues associated with water consumption, energy, waste transportation, etc. It was also important to realize that the communication and involvement of the community, both institutionally and locally, was also a valued dimension in the assessment of sustainability in HEIs. On the contrary, social responsibility and stakeholder participation was rarely included in these studies. This reveals that HEIs continue to stay away from companies and stakeholders even in this domain for the creation of a culture of sustainability in societies. As referred by Caeiro et al. (2020, p. 8), according to several authors, there are many researches that consider "the overall

implementation of these tools is still low and its development is still at an early stage".

GREENING FROM HEIS : EUROPE AND FAUL

In 2021 the European University Association EUA, considering the challenges and opportunities to "increasing awareness and taking concrete action towards a green, environmental-friendly and resources efficient university", and attended the Sustainable Development Goals (SDGs), developed a survey with the aims to collect good practices and measures to follow suit by IES. A sample of 305 valid responses was obtained, with one institutional response per higher education, from 48 European countries, in which Portugal participated with 19 higher education institutions.

"In the context of this work, greening is defined as increasing awareness and taking concrete action towards a green, environmentally friendly and resource-efficient university. This may address the university's mission and campus, and its members, but also entails a contribution towards its larger community and surroundings. It may or may not be part of a broader approach to address the SDGs and contribute to the 2030 Agenda" (Stöbe, et al., 2021, p. 3).

From this research, a specific qualitative and exploratory research was developed, to know the perception, engagement, and opinion of the academic community of the FA on some of the collective on greening and environmental sustainability actions. In this sense, for our case study, an empirical research was developed, carrying out a literature review on the urban integration of the FA campus and later applied a questionnaire to its academic population, where we adapted the sequence of questions proposed by the EUA. The data obtained considering descriptive statistics and referring to the following aspects: the integration policies of the greening actions, include activities and measures in different areas, mobilities, teaching and learning, research and innovation, physical green campus, communication, engagement, impact of the Covid 19 pandemic on the institution, inter alia. In the end, the results obtained allow a framework as a European assessment and review and implement directives inspiring a green campus more focused on all its users.

The Faculty of Architecture of the University of Lisbon (FAUL) is part of the 18 faculties and institutes that make up the campuses of the University of Lisbon (ULisboa). FA.ULisboa is a leading institution in the professional training of architects, urban planners and designers, offering bachelor, master and doctoral degrees, as well as scientific research in these areas. The FA, with about 2500 national and international students, is part of the Alto da Ajuda University Campus, located on a site with a very rugged topography, and overlooking the riverfront and the historic buildings of Ajuda Palace and Monsanto Forest Park.

This campus, planned as an urban aggregating unit in continuity with the consolidation of the urban network in terms of landscape and urban planning, and to aggregate the various Schools of the Technical University of Lisbon, university residences and the respective services and commercial,

sports and social equipment, remained incomplete, and currently consists only of the Faculty of Architecture of the U. of Lisbon, the Faculty of Veterinary Medicine, the Higher Institute of Social and Political Sciences and the Center for Physical Activity and Recreation (CEDAR) to support the faculties. This university campus, being an unfinished space and without any bridge with the urban environment, can compromise some of its goals for sustainability.

Data Survey - Results

Data were collected by submitting a questionnaire to the academic community of FA, and respondents were selected using a convenience sampling method and considering descriptive statistics. A total of 238 valid responses were recorded from FA of which 65% were undergraduate, master and doctoral students, 30% were teachers and 5% were employees. In the field of initiatives practiced by the FA, the following were analyzed:

Engagement and strategies communication -The results obtained reveal that about half of the respondents are unaware of the implementation of concrete activities and processes in action in this area. Only 25% recognize that the educational community is attentive and aware of the establishment of partnerships and the involvement of other faculties or student organizations. Only 13% claim to know internal measures and policies on responsible consumption and production.

Learning, Teaching, Research and Innovation - In the Teaching and Learning domain we were interested in knowing whether in the FA activities are carried out or topics on sustainability are addressed in the various syllabuses. Of the respondents, 53% of undergraduate students and 44% of master's students indicate that this topic is addressed in class, associated either with the three pillars of sustainability or only with environmental issues. The same is true for the optional subjects (38%). Teachers also stated that this theme was addressed in undergraduate (74%) and master's degrees (51%). As for the doctorates, 48% stated that these objectives were addressed and discussed. In general, this theme is not explored in extracurricular activities, and they often mentioned that they know more about the development of specific activities, rather than research projects or organizational policies.

Green impact - Regarding the benefits that initiatives on sustainability could have on FA, the data reveal that the vast majority believe that these actions could contribute to improving the quality of life on campus (71%), whether approached at the level of create a "real-life" learning opportunities (71%), or at the stimulate research level (76%). These actions were also highly valued for their contribute to raising awareness and changing the behaviour of the academic community (83%) and also the community surrounding the campus (76%).

Drivers/ Obstacles - Regarding the possible obstacles that the FA may face in the implementation of more sustainable measures, more than half of the respondents pointed out that the low involvement of the academic community (70%) for these issues, the lack of awareness raising actions (67%) and lack of incentive from the structures and leaderships (65%) could condition

the growth of a greener campus. A much lower percentage did not consider as important the participation of either faculty (40%) or stakeholders (37%) for this process.

Benefits and challenges - The perception of the challenges that, in the future, may be useful for a more sustainable development of this institution, almost all the respondents considered the institution's values (93%), social responsibility (95%) and efficiency in social, economic, and environmental performance (90%) very important and important. Also, the initiatives adopted by the academic community (93%) and by the leadership (86%) were valued by the great majority. In general, the local context, collaboration with industry, national or international policies and funding were valued by only about half of the participants. From a perspective of valuing the adoption of future actions for the growth of sustainability on campus, the strategic aspects associated with the promotion of Renewable and Sustainable energy, water consumption, recycling and waste management and reduction of plastic consumption were the most valued, unlike the measures related to the use of public transport, hybrid/electric cars and access to their charging systems.

Covid-19 - The Covid-19 pandemic crisis posed HEIs new opportunities and challenges about their contribution to sustainability and increased the responsibility for participation of the whole community in this process. To the question about whether the experience as distance learning was positive (45%) or negative (40%) the opinions are almost equally divided. Another aspect to highlight in this area was that the majority considers it necessary to have a plan to create a mixed distance learning (b-learning) course, with about 36% supporting distance learning and only 22% supporting that distance learning courses should be created. Less than half of the respondents also believe that with this crisis there is a greater awareness of environmental issues, but that these have been placed in second place.

DISCUSSION AND CONCLUSIONS

This discussion focuses on the FA sustainable Design approaches towards green Campus and is supported by the results presented, integrating them with the data and guidelines left in the Report EUA (Stöber, et al, 2021). This leads us to recognize some weaknesses in this critical discussion, considering that this study was based on data obtained by an institutional response by HEIs at European level, while our results result from the responses obtained a survey to the academic community of FA. In this sense, we do not intend to compare results, but to understand how these two realities, so distinct and united in their higher education mission and in the commitment and paths to be taken for a more sustainable development, may cross or distance themselves in the process of action at the level of activities and approaches of the institutions, for carbon reduction and transformation of a more sustainable campus in social and economic terms.

Framing our institutional results in a European view, which reveal that 82% of HEIs in europe have already adopted greening measures in place, supported by policies and regulations, and 14% are considering adopting such measures in the future, we realize that the FA academic community

mostly admits to not knowing about the measures and policies at national and institutional level on this issue. As Stöber, et al, (2021) reports, France is the only country that has a policy dedicated exclusively to greening in higher education. The other countries' institutions noted general national environmental protection laws.

The participation of greener teaching and learning, along with sustainability-focused research and innovation, translates into very distinct points. The vast majority of European HEIs claim to have acted at the level of study plans (79% bachelor and 82% master), extracurricular activities (94%), either in a more comprehensive way or with one-off activities. In FA, half of the students and 2/3 of the lecturers state that these competences are developed in classes, which is not the case at the research level. The US HEIs recognize the existence of green measures and activities in research and innovation, whether through laboratories or project development. It will therefore be important to continue to promote inter and transdisciplinary approaches to environmental, cultural, or social problems as advocated by Taylor, J. (2021) and, at the same time, to launch initiatives on sustainability to stimulate research and innovation, as suggested by 76% of FA respondents.

With the experience of online work and classes, there has been a change in the way of thinking about teaching methodologies and the way HEIs can organize themselves, promoting the virtual work of students and staff, thus contributing to expand the role of universities in the green society, even if critically. The EUA Report reveals that with the pandemic crisis, HEIs are more willing to act on transport mobility and digital information transfer, promoting remote work and virtual meetings, Interestingly, in these two studies, about 1/3 of respondents agree that there is a greater awareness of environmental issues after the Covid-19 crisis.

In the analysis of the benefits arising from the environmental management activities practiced in university campuses, these are recognized by all as an added value for human well-being and environmentally friendly, within universities and in the community in general. From the set of activities associated with the reduction of the ecological footprint, the academic community of FA has highlighted the monitoring and reduction of plastics, renewable energy, waste management, among others, despite the barriers identified and to be overcome for the success of this process, including constant awareness-raising actions and greater proactivity from the leadership.

Some important strategies were identified to improve sustainability in universities. While lack of funding was a challenge noted by about half of the institutional respondents from European universities and involvement in thematic networks on greening are frequent, in FA, most respondents did not value the need to obtain national or international funding, specific funds or the creation of support networks and collaboration for the work of education, research, innovation and environmental, social and economic efficiency practices. As Bizerri, et al. (2018) argue, the specific characteristics of each university should be guiding for each institution's sustainability implementation adequacy processes.

The integrative approach of the whole academic community of the FA in this theme was one of the essential points of this study, because, more than

knowing the level of integration of sustainable practices in the FA campus, we were interested in understanding the perceptions of this community regarding the policies, paradigms and values that support the activities towards sustainability in the FA. We also associated the objective of knowing the degree of importance that some concrete measures associated with sustainability, which could have, in this process, some priority to be given to the implementation of sustainability initiatives and the suggestions presented.

Considering the results of the questionnaires, we hope that new strategies can be put into practice, triggering drivers aimed at systematic dissemination of sustainable practices, with greater coordination of activities and strategic support, involving all participants in this mission, in each Faculty and throughout the University. We know that, as HEIs are important agents of social change, it is up to them to promote sustainable development according to a holistic and integrated approach, through research activities and the incorporation in curricula of guidelines on sustainability, developing skills and raising students' awareness of this issue.

Finally, and challenged by the changes Covid-19 has brought to the entire academic community with the implementation of online work, we leave open the space for the development of an online collaborative platform for sharing sustainable policies and ideas to be applied on the FA campus and in all faculties of Ulisboa, broadening participation to stakeholders, NGOs, businesses and the surrounding community for this increasingly essential challenge.

REFERENCES

Agenda 21 (1992). Website: https://www.dge.mec.pt/sites/default/files/ECidadania/Areas_Tematicas/guia_agenda_21_local.pdf

Agenda 2030 (2015). (https://sustainabledevelopment.un.org/content/documents/8521Informal%20Summary%20-%20UN%20Summit%20on%20Sustainable%20Development%202015.pdf)

Bizerri, M.X.A. Rosa,M.J. Carvalho,T.(2018). Construindo uma universidade sustentável: uma discussão baseada no caso de uma universidade portuguesa. Avaliação (Campinas), Sorocaba, v. 23, n. 2, pp. 424–447. DOI: http://dx.doi.org/10.1590/s1414-40772018000200009

Caeiro, S. Sandoval Hamón, L.A. Martins, R. Bayas Aldaz, C.E. (2020) Sustainability Assessment and Benchmarking in Higher Education Institutions—A Critical Reflection. Sustainability, 12(2), 543. Website: https://doi.org/10.3390/su12020543

Cortese, D.A. (2003) The Critical Role of Higher Education in Creating a Sustainable Future. Planning for Higher Education, 31(3), 15–22, p. 17.

Delgado,C.C.J. Vélez,C.Q. (2005). Sistema de Gestión Ambiental Universitária: Caso Politécnico Gran Colombiano. Website: http://ecnam.udistrital.edu.co/pdf/r/edge02/node03.pdf.

EUA (2021) https://eua.eu/resources/expert-voices.html?filter_author=Amanda %20Crowfoot

EUA survey: greening at higher education institutions. Website: www.eua.eu/downl oads/content/survey%20on%20greening_preview.pdf.

Godemann, J. Herzig, C. Moon, J. (2011) Integrating Sustainability into Business Schools: An Analysis of 100 UN PRME Sharing Information on Progress (SIP) reports. ICCSR Research Papers Series, Nottingham.

Guni (2019). Implementing the 2030 Agenda at Higher Education Institutions: Challenges and Responses. Website: www.guninetwork.org/files/guni_publicati on_-_implementing_the_2030_agenda_at_higher_education_institutions_challe nges_and_responses.pdf.

Karatzoglou, B. (2013). An in-depth literature review of the evolving roles and contributions of universities to education for sustainable development. Journal of Cleaner Production, 49, 44–53

Lambrechts, W. Mulà, I. Ceulemans, K. Molderez, I. Gaeremynck, V. (2013) The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. J. Cleaner Prod. 48, 65–73.

Lang, D.J. Wiek, A. Bergmann, M. Stauffacher, M. Martens, P. Moll, P. Swilling, M. Thomas, C.J.(2012) Transdisciplinary research in sustainability science: practice, principles, and challenges. Sustainability Science 7 (1), 25–43.

Leal Filho, W. Wu, Y.-C.J. Brandli, L.L. Avila, L.V. Azeiteiro, U.M. Caeiro, S. Madruga, L.R.D.R.G (2017) Identifying and overcoming obstacles to the implementation of sustainable development at universities. J. Integr. Environ. Sci. 2017, 14, 93–108.

Lozano, R. (2006). Incorporation and institutionalization of SD into universities: breaking through barriers to change. Journal of Cleaner Production, 14, 787–796.

Rieckmann, M. (2012). Future-oriented higher education: Which key competencies should be fostered through university teaching and learning? Futures 44 (2), 127–135.

UNESCO – United Nations Educational, Scientific and Cultural Organization (2005). International Implementation Scheme. United Nations Decade of Education for Sustainable Development (2005-2014), Paris.

Sayed, A., Kamal, M., Asmuss, M. (2013). Benchmarking tools for assessing and tracking sustainability in higher educational institutions. Int. J. Sustain. High. Educ. 2013, 14, 449–465

Stöber, H. Gaebel,M. Morrisroe, A. (2021) Greening in European higher education institutions.EUA survey data. Website: https://eua.eu/resources/publications/982: greening-in-european-higher-education-institutions.html.

Taylor, J. Jokela, S. Laine,M. Rajaniemi, J. Jokinen, P. Häikiö, L. Lönnqvist, A. (2021). Learning and Teaching Interdisciplinary Skills in Sustainable Urban Development—The Case of Tampere University, Finland. Sustainability 2021, 13, 1180. Doi.org/10.3390/su13031180

Velazquez , L. Munguia, N. Platt, A., Taddei, J.(2006) Sustainable university: what can be the matter? Journal of Cleaner Production, 14, 810-819

Wals, A.(2012) Shaping the Education of Tomorrow. 2012 Full-length Report on the UN Decade of Education for Sustainable Development. Paris

Zitzke, V.A.(2002). Educação Ambiental e Ecodesenvolvimento. Revista Eletrónica do Mestrado em Educação Ambiental. v. 9, 2002. Website: www.fisica.furg.br/m ea/remea/vol9/a13art16.pdf.