

Reference:

Aleixo, A.M., Azeiteiro, U. M., & Leal, S. (2018). The implementation of sustainability practices in Portuguese higher education institutions, *International Journal of Sustainability in Higher Education*, 19(1), 146-178, <https://doi.org/10.1108/IJSHE-02-2017-0016>

The Implementation of Sustainability Practices in Portuguese Higher Education Institutions

Ana Marta Aleixo, University Aberta and Politecnico of Leiria, Portugal

Ulisses Miranda Azeiteiro, Department of Biology & Centre for Environmental and Marine Studies, University of Aveiro, Portugal

Susana Leal, School of Management and Technology and Life Quality Research Centre, Polytechnic of Santarem, Portugal

Corresponding author: Ana Marta Aleixo

anamartaafsanos@gmail.com

Abstract

Purpose – The main aim of this work is to analyze the current state of implementation of sustainability development (SD) in Portuguese Higher Education Institutions (HEIs).

Design/methodology/approach – A questionnaire was developed to measure the level of implementation of SD practices in HEIs as well as the number of rankings, certifications and declarations of these institutions. The questionnaire was sent by e-mail to all rectors, presidents, directors of faculties, departments and schools of Portuguese universities and polytechnics. A sample of 53 leaders was obtained.

Findings – Portuguese HEIs are mainly engaged in the social dimension of sustainability. The economic dimension emerges in second place and the institutional in third; the environmental dimension is the least developed. Except for a few specific topics (e.g., related to research on SD, and the offer of degree courses in SD), there are no significant differences between universities and polytechnics in the implementation of SD practices. Only 11% of HEIs are innovators in the implementation of SD practices, and the majority of HEIs have implemented less than 34% of the SD practices studied.

Research limitations/implications – This research has a national scope and the results should be interpreted only in the Portuguese context. Future studies should include a larger range of institutional actors within the faculty.

Practical Implication – This study provides valuable insights and theoretical and methodological guidance for future implementation processes supporting the transition to sustainability in HEIs.

Originality/value – This is the first study conducted in Portuguese HEIs with the aim of determining their efforts to implement and promote sustainability.

Keywords Sustainable Development; Higher Education for Sustainable Development; Sustainability Higher Education Institutions; Whole institution approach; Leadership for sustainability; Portugal

Paper type Research paper

1. Introduction

In the last decades, the number of initiatives, charters and declarations to promote Sustainable Development (SD) has significantly increased (beginning in 1972 with the Stockholm Conference (UNEP, 1972). The role played by Higher Education Institutions (HEIs) in the promotion of SD has been recognized as vital (e.g., Lozano, 2006, Lozano, 2010, Lozano, 2011, Lozano *et al.*, 2013a). More specifically, the environmental, social and cultural, economic, and institutional, educational and political dimensions of SD have been more actively integrated in their teaching, research, campus operations, community outreach, and assessment and reporting activities (e.g., Cortese, 2003, Lozano, 2006; see for this purpose Aleixo *et al.*, 2016, and Lozano *et al.*, 2015). HEIs have also demonstrated growing commitment to SD in their declarations and support of charters and agreements, as well as through effectively implementing SD initiatives and practices. Lozano (2006, 2010, 2011) and Lozano *et al.* (2013b) have long taken an interest in the subject of SD and its implementation in HEIs. HEIs are developing sustainability practices as part of their intervention and Hopwood *et al.* (2005) state that it is essential to map them. However, SD measures can only be fully implemented if SD has been accepted by everyone in the institution (Lozano *et al.*, 2013a).

Lozano *et al.* (2015) performed a worldwide survey about the commitment to and implementation of SD in higher education; 80% of their responses were from European HEIs,

and most of the professionals that answered the survey came from a network of colleagues interested in implementing SD throughout their HEIs. Larrán Jorge *et al.* (2015) studied the perceptions of rectors, senior management faculty and administrative staff about the implementation of sustainability practices in Spanish universities (a similar geographical and historical-cultural context to this study). Also in the Spanish context, Leon-Fernandez and Domínguez-Vilches (2015) analyzed the implementation of environmental management and sustainability initiatives in university activities. On the other hand, Larrán Jorge *et al.* (2015) created a new multi-item quantitative tool for the integrated measurement of the social, economic and environmental dimensions of sustainability in universities, also applied in Spain. Similarly, Vagnoni and Cavicchi (2013) studied the status of the implementation of sustainability practices in Italian universities, and underlined its strengths and weaknesses. Lozano *et al.* (2015) and Larrán Jorge *et al.* (2015) pointed out the need to study this issue in other national contexts (notably Portugal), and to include not only rectors and senior management in surveys but also other middle management staff at HEIs, such as directors of departments, faculties or schools, in both universities and polytechnics. Since most schools (from polytechnics) and faculties and departments (from universities) have scientific, pedagogic and administrative autonomy from the central services, it is possible that in the same HEI there is different behaviors relatively the adoption of SD practices (as well as different perceptions), justifying that we should take a broad view and consider also middle management staff to assess the implementation of sustainability initiatives. Following the four essential SD dimensions (environmental, economic, social/cultural, institutional/educational/political; Aleixo *et al.*, 2016; Lozano, 2011; Seiffert and Loch, 2005) is also an innovative approach to studying SD practices that complements studies addressing the traditional SD areas (e.g., education, research, campus operations and community outreach).

The purpose of this study is to fill the research gap on the perceptions of leaders of Portuguese HEI in relation to SD initiatives, projects and practices implemented in their institutions. Because higher education in Portugal is characterized by a dual system, with universities and polytechnics, and past research suggests differences between them in the implementation of SD practices (Aleixo *et al.*, 2016), both subsystems were analyzed. Taking into account the growing interest of HEIs worldwide in SD, the research question is: *Are Portuguese universities and polytechnics implementing SD practices?* This work is the first attempt to fill this gap in the literature in the Portuguese context.

This research follows the theoretical approach of Lozano *et al.* (2015) and Larrán Jorge *et al.* (2015, 2016) to the implementation of sustainable development in higher education. The research has the following main objectives: (1) to describe the degree of implementation of sustainability practices (in the environmental, economic, social and institutional dimensions of SD) in Portuguese HEIs), and identify the rankings, certifications and declarations in the SD domain adhered to by Portuguese HEIs; (2) to analyze whether there are differences between the implementation of SD practices in polytechnics and universities; (3) to examine any differences between the implementation of SD practices reported by rectors/presidents (central services) versus directors of departments, faculties or schools (decentralized services); and (4) to study the stage of SD implementation in Portuguese HEIs.

Regarding the research specifically on Portuguese public HEIs, the findings contribute to a better understanding of sustainability projects, practices and strategies implemented by Portuguese HEIs, and also provide a better understanding of the stage of SD implementation in these institutions. In addition, they will allow SD practices in Portuguese public polytechnics and universities to be compared as well as those of central and decentralized services.

2. Theoretical background and literature review

2.1. Implementation of SD in HEIs

In the last few years, some relevant studies have been conducted on HEIs' engagement in implementing SD practices (e.g., Hancock and Nuttman, 2014, Cebrian *et al.*, 2015, Sammalisto *et al.*, 2015, Too and Bajracharya, 2015, Dyer and Dyer, 2017). There are also examples of SD practices in different dimensions (e.g., environmental, economic, social and institutional) worldwide, and integrated in the core activities of HEIs (e.g., education, research, operation, commitment engagement and governance/culture (Fischer *et al.*, 2015).

With regards SD in HEIs, while some researchers claim that SD is implemented in all HEI systems (Cortese, 2003, Lozano, 2006, Lozano *et al.*, 2013b), it is recognized that a holistic approach has not been taken because actions have been compartmentalized and applied in only one or two dimensions of the education system (Lozano *et al.*, 2015). In addition, the promotion of SD in HEIs needs to follow the example of the American College & University Presidents' Climate Commitment (Dyer and Dyer, 2017) and shift from being a collection of distinct programs to a strategic imperative.

2.2. Dimensions of SD in HEIs

Three pillars of dimensions of SD have been identified in the literature (e.g., Waas *et al.*, 2011, Godemann *et al.*, 2014, Amaral *et al.*, 2015, Sammalisto *et al.*, 2015): economic, social and environmental. However, it is increasingly common to find other SD pillars, notably institutional (e.g., Lozano, 2008, Disterheft *et al.*, 2013, Leal Filho *et al.*, 2015) and cultural (e.g., Lozano, 2008, Disterheft *et al.*, 2013, Leal Filho *et al.*, 2015). Meanwhile, four dimensions of SD have also been proposed for sustainability practices and the implementation of SD in HEIs (e.g., Lozano, 2011, Alonso-Almeida *et al.*, 2015, Larrán Jorge *et al.*, 2015, Aleixo *et al.*, 2016), more specifically, environmental, economic, social/cultural, and institutional/educational/political.

The economic dimension of SD involves economic viability and addresses economic needs (e.g., concern about economic performance, plans to improve energy efficiency and budget for practices promoting SD). The environmental dimension of SD proposes the integration of environmental concerns into the organization's strategy (e.g., construction of sustainable buildings on campus, separation of waste and its forwarding for recycling, and equipment to generate renewable energy). The social and cultural dimension of SD refers to actions either by an organization's human resources or the surrounding community (e.g., policies promoting equality and diversity, developing and participating in recreational, cultural or sports activities, concerns and initiatives for social inclusion, and cultural or scientific initiatives targeting the outside community). The institutional, educational and political dimension of SD refers to how institutions shape their behavior and values, and how different stakeholders perceive the approach to and objectives of SD (e.g., SD included in the HEI mission, vision and values; concern with ethical issues; and HEI has curricular units on SD). Table 1 summarizes the main SD practices in HEIs.

Table 1 – Dimensions and practices of sustainable development in HEIs

Dimensions	Practices
Environmental	Declarations and actions related with HEIs' involvement in environmental issues and resource scarcity (environment and management of natural resources; prevention of pollution; protection of environment and biodiversity; restoration of natural habitats; ecological footprint; non-renewable resources; depletion of materials; degradation).
Economic	Declarations and actions related to the direct economic impact and financial sustainability of HEIs (financial situation; results; efficiency).
Social/Cultural	Declarations and explanations on policies and procedures concerning human rights (labor practices and decent work; human rights; quality of life, occupational health and safety; the equity dimension; training of employees, involvement in social issues and action within HEI community).

Institutional/Educational/Political	Declarations and statements on the HEI views, values, strategy, transparency in governance and ethical commitments. Also declarations, charters and partnerships on national and international criteria for promoting sustainable development. Practices in education, research, university operations (e.g., certifications), community outreach and assessment and reporting were also considered.
-------------------------------------	--

Note: Adapted from Aleixo et al. (2016)

2.3. Activities and Assessments of SD in HEIs

Cortese (2003) refers to four SD activities in HEIs - education, research, campus operations and community outreach - whereas Lozano (2006) proposes the addition of the communication and disclosure of SD practices as a fifth activity (Lozano, 2006, Lozano, 2011, Lozano *et al.*, 2013a, Lozano *et al.*, 2013b). This fifth activity involves the HEIs' communication with the different stakeholders through education, research, operations on campus, community outreach and raising awareness in the community (e.g., evaluation and reports of the SD).

The activities related to SD education should include the revision of learning outcomes and curriculum reformulation (Disterheft *et al.*, 2016) and the introduction of SD concepts as a subject in the curriculum of all disciplines and courses in HEIs, as well as workshops, conferences and seminars about SD. The integration of SD into curricula “can be done vertically (sustainability integrated via specific sustainability-related courses) or horizontally (sustainability integrated within different regular courses of the curriculum)” (Stough *et al.*, 2017). The research activities encourage research on SD issues addressing societal challenges, as well as interdisciplinary research groups for a new approach in a sustainable manner (Popescu and Bebeau, 2014). On-campus activities relate to green campus initiatives and campaigns, with the focus on operational improvements (Disterheft *et al.*, 2016). Community outreach covers activities in which HEIs are involved with regional and local development, and with the civil society to foster a more livable, socially inclusive and resource-efficient environment (Popescu and Bebeau, 2014). Nevertheless, as Dyer and Dyer (2017) note, cross-disciplinary education, research, and practice is required for sustainability to be achieved in society.

As stated by Larrán Jorge *et al.* (2015), HEI leaders should show their commitment to sustainability by signing HEI declarations (e.g., United National Compact – Principles for Responsible Management Education). For White (2013), the sustainability of institutions entails the adoption of measurable and manageable objectives. Sustainability assessment tools (e.g., AASHE – The Association for the Advancement of Sustainability in Higher Education) could play a strategic role not only in developing a holistic and systemic approach to sustainability, but also

as a vital facilitator for the move towards sustainability. There are numerous sustainability assessment tools for higher education and an extensive review of the literature on this can be found in Larrán Jorge *et al.* (2016).

HEIs could also implement changes in the quality, environment and social responsibility processes, improving their performance, and ultimately obtain certifications, notably: Quality Management Systems (ISO 9001), Environmental Management Systems (EMS), or Social Responsibility Standards (SA8000 and ISO 26000), or Social Responsibility Standards certifiable in each country and already adopted by some HEIs (see Disterheft *et al.*, 2012).

In recent years, there has been increasing discussion about the importance and contributions of HEI rankings (and how that can be a distinguishing parameter/or advantage for institutions). Lukman *et al.* (2010) defend that rankings show “where a specific university is in the forefront, where it might be lagging behind, or what needs to be improved in order to achieve a better position”. As a result, social responsibility, the impact and quality of scientific research, academic excellence and sustainability have become key aspects to distinguish HEIs and determine their prestige. In this regard, the Academic Ranking of World Universities was the first international ranking system dating back to 2003 (Moura and Moura, 2013). Even though there are now over 33 rankings for higher education institutions (Shin and Toutkoushian, 2011), few Portuguese HEIs are found in them. GreenMetric, an initiative of the Universitas Indonesia, is the only known ranking for SD (Gómez *et al.*, 2015).

Popescu and Bealeu (2014) note that there is no single path or instrument in general use for the implementation of SD values or to evaluate the results. They therefore argue that “elaborating unitary models could help improving the effectiveness of university approach for SD, and controlling the implementation of the programs developed at international, regional and national levels”. For a review of global sustainability rankings in higher education, and their comparison with GreenMetric see, for instance, Lauder *et al.* (2015).

The implementation of the SD activities and their assessment could be seen within the framework of the Deming Cycle, as done by Vagnoni and Cavicchi (2015). The implementation of the SD practices is considered in the “Do” phase of the Deming Cycle, whereas the assessment is considered in the “Check” phase (Vagnoni and Cavicchi, 2015). Both are important phases for the continuous improvement of the implementation of SD in HEIs.

2.4. Stages of SD in HEIs

Rogers' theory on the adaptation and diffusion of innovation (Rogers, 1995) has been used within the framework of the SD intervention and behavior of the main HEI stakeholders (administrators, faculty and students) namely by Lozano (2006) and Lozano et al. (2013). There are five stages of implementing SD (see Lozano, 2006, Lozano *et al.*, 2013b): (i) innovators, (ii) early adopters, (iii) early majority, (iv) late majority, and (v) laggards. Assuming that Rogers' theory on adaptation and diffusion of innovation (Rogers, 1995) is a suitable theoretical model for the study of factors influencing the adoption of SD practices in HEIs, and following Lozano (2006) and Lozano et al. (2013), we propose an interpretative model for the phases of implementation of SD in HEIs and adjust Rogers' terminology to the different stages or phases of implementation (the five stages are defined in Table 2). Whereas SD is well integrated and developed in HEIs that are in the innovator stage, there is a higher level of resistance to change in the later stages, notably in the late majority and the laggard stages. This categorization was used in a preliminary study by Aleixo et al. (2016).

Table 2 –*Classification of stages of SD in HEIs based on Rogers' theory*

Adopter category	Definition
Innovators	Innovator are willing to take the risk of adopting SD in all the institution's system. Can present themselves as an institution of prestige/quality with a more stable financial situation that conducts more relevant SD research and belongs to a network of HEIs (probably also innovators) interested in the SD area, notably foreign institutions. These HEIs are committed to sustainability on a long-term basis by means of SD policies and projects, certifications and staff dedicated to the area (Leal Filho, 2010). These HEIs adopt most SD practices immediately or as fast as they can (immediate adoption).
Early adopters	Show great resemblance to innovators, but are more discreet in adopting SD in the HEI. Most senior staff of the HEI see SD as very important and strategic, but the urgency in implementing it is less evident. Nevertheless, compared with the following phases, they adopt most of the SD projects and practices in the short-term (short-term adoption).
Early majority	Although the time taken by these HEIs to adopt SD varies, it is significantly longer than the innovators and early adopters. Have some reservations, which only change after knowing the advantages of adhering to SD in HEI. For HEIs in this stage, instrumental reasons are the main motivation to adopt SD practices. HEIs tend to take some time to adopt these practices (medium-term adoption).
Late majority	The HEIs in this phase only adopt an innovation after most HEIs have already adopted it and are very skeptical about innovations. HEIs tend to take long time to adopt these practices (long-term adoption).
Laggards	They are the last to adopt SD. These HEIs typically have an aversion to change and to considering SD important and a priority for their HEI. The principles of SD are not universally understood, there are no significant efforts nor systematic projects to promote SD (Leal Filho, 2010). These HEIs do the minimum related to SD (the last to adopt).

Note: Elaborated with insights from Rogers (1995), Lozano (2006) and Leal Filho (2010).

According to Larrán Jorge *et al.* (2015), the rectors and senior management of Spanish HEIs do not believe sustainability practices are strongly implemented, and they also suggest leadership plays an important role as a “driver when the leader sees transformation as a way to leave his or her legacy to the organization”. Taking the five stages of implementation of sustainability as reference, they state that the sustainability champions are often observed as “innovators”. In addition, the results of Aleixo *et al.* (2016) showed that the Portuguese Public HEIs are predominantly in the early stages (laggards and late majority) of SD.

On the other hand, Leon-Fernandez and Dominguez-Vilches (2015) argued that the Spanish universities had significantly increased their efforts to incorporate environmental sustainability, and investments in sustainable campuses had therefore gone up. But in terms of environmental assessment in the Italian context, the study by Vagnoni and Cavicchi (2015, p. 232) showed that only one of 67 universities has an environmental management system (ISO 14064), and they confirm that there is “a general lack of environmental management systems”; they also observed that “policy of sustainability is taking root in the universities' agendas”.

2.5. The Portuguese higher education system and SD in Portuguese HEIs

There are both public and private HEIs in Portugal, namely universities, university colleges, polytechnics institutes. Their over-riding objective is to foster promote research and create knowledge by providing solid scientific and cultural preparation, technical training to perform professional and cultural activities, and by fostering the development of competences, innovation capacities, and critical analysis (DGES - Direcção Geral do Ensino Superior, 2015).

By the end of 2016, the Portuguese public network of HEIs was made up of fourteen universities, twenty polytechnic institutes, and eight higher education schools for the military and police. However, it is noted that although this study addresses the universities and polytechnics, some polytechnic schools are integrated in the university system (14 polytechnic schools were integrated in six universities), and are therefore included in the university domain. The Military and Police Higher Education system is not included in this study due to its very specific form of organization, educational context and objectives.

Public higher education institutions are defined by decree-law as part of the national network of higher education (DGES - Direcção Geral do Ensino Superior, 2015). Higher education has been on the political agenda in Portugal for some time due to its importance to economic and social development, and significant changes have therefore been made. A binary system (university and polytechnic) was adopted in the 1980s, as in other European countries, which created a

subsystem of polytechnic education. The aim of the polytechnic network was to provide training that was closely linked to the economy and industry; in other words, more technical, profession-oriented, focusing on "know-how" and designed to meet the social, economic and regional needs. Both subsystems have similar missions, although the university higher education system is more focused in the academic knowledge, the science and the technology, and research whereas the polytechnic is more focused in professional knowledge and knowledge transfer.

Faculties, schools and departments of the Portuguese's HEIs have scientific, pedagogic and administrative autonomy (Law n. º 62/2007 10th September) from the central services and it is predictable some informational asymmetry between rectors/presidents and managers of faculties/schools and departments relatively to the perceptions of SD practices implemented. Asymmetry is expected because the information flow from the top to the bottom (and from the bottom to the top) is not always mandatory in a decentralized organizational structure; from the other side, if the departments/schools have autonomy in defining some initiatives, and do not need support of leaders, it is possible they not even communicate these initiatives to the top.

In recent years, the responsibility and intervention of HEIs has grown and now includes broader functions of study and research. As we progress toward a knowledge economy in which the economic value of science is growing, some authors attribute a "third mission" to HEIs (Jongbloed et al., 2008), namely contributing to the economic development of a country or region by the transfer of knowledge to the business sector.

Like other countries, the Portuguese government has not yet approved legislation with regard to the implementation of sustainability in higher education. In the Spanish context, Larrán Jorge *et al.* (2015) refer to new legislation for this purpose (e.g., Law 4/2007 on universities and the Law 2/2011 on sustainable economy). Some of the Portuguese HEIs that have already implemented SD practices are doing so mainly with the existing human resources or thanks to the voluntary participation of the university community (e.g., University of Minho, Pardellas Santiago, 2016).

3. Methods

3.1. Survey design and procedures

A questionnaire was developed to collect data from HEIs leaders on the implementation of SD practices in their institutions. The HEIs' certifications and declarations on SD matters as well as the international rankings in which they participate were also addressed in the questionnaire.

The first step of the questionnaire design involved an extensive literature review and the study of the previous surveys on the theme (e.g., Disterheft *et al.*, 2013, Fischer *et al.*, 2015, Lozano *et al.*, 2015), with the aim of producing a list of items to assess the implementation of SD practices. The main assessment tools for sustainability in HEIs were also considered in this process: (i) AISHE – Auditing instrument for sustainability in higher education; (ii) GASU – Graphical Assessment for Sustainability in Universities; (iii) CSAF – Campus Sustainability Assessment Framework; (iv) STAUNCH – Sustainability Tool for Assessing Universities’ Curricula Holistically; (v) CITE/AMB – Network of Science, Technology, Innovation and Environmental Education in Latin America; (vi) DUK – German Commission for UNESCO; (vii) GMID – Graz Model for Integrative Development, and (viii) STARS – Sustainability Tracking, Assessment and Rating System. As a result of the literature review, the authors found a total of 112 items for measuring the implementation of SD practices in HEIs. These items were grouped according the above mentioned four dimensions of SD, more specifically, environmental, economic, social/cultural, and institutional/educational/political (e.g., Lozano 2011, Alonso-Almeida *et al.*, 2015, Larrán Jorge *et al.*, 2015, Aleixo *et al.*, 2016). The core activities of HEIs (e.g., education, research, operations, and community engagement; Fisher *et al.*, 2015) were also considered in each SD dimension.

The first list of items was reviewed by the authors: (a) to minimize redundancies and similar items; (b) to ensure that all relevant practices were considered; (c) to equilibrate the weight of HEIs' different core activities (e.g., traditionally the weight of on-campus practices is higher than the weight attributed to others, particularly education and research activities; Fischer *et al.*, 2015) in each SD dimension. After this procedure, the number of items for measuring the implementation of SD practices in HEIs was reduced from 112 to 77.

Cognitive interviews (Miller, 2014) were conducted with ten respondents to pre-test the questionnaire (to get feedback). Cognitive interviews are one of the most recommended pre-testing methods for self-administered questionnaires (Mohorko and Hlebec, 2016). The pre-test sample includes one vice-president, one vice-director, one head of the president’s office, one administrator of social service, one director of library services, two research and development technicians, one human research technician, one teacher, and one director of administrative services department. The pretest was conducted face-to-face. After answering the questionnaire, the respondents provided information about the questions (Miller, 2014). The main objectives of the pretest were to identify interpretative errors, analyze the pertinence of the items for HEIs, detect question problems and assess the options of response (from 1 to 5).

For instance, it was mentioned that some issues are mandatory for HEIs, e.g. institutional information, accountability, anti-corruption policies; these items were therefore deleted from the questionnaire. The assessment scale was also tested and was improved with the feedback obtained. Following the pretest, the survey was restructured in light of the feedback received. After these procedures, a list of 77 items was used to measure the implementation of SD practices, SD initiatives or SD projects in HEIs, which are organized in four dimensions (environmental, economic, social/cultural, and institutional/educational/political). The full list of items, organized by dimension, can be found in Tables 5 to 8. The environmental dimension has 13 items (Cronbach Alpha: 0.86), the economic dimension 11 items (Cronbach Alpha: 0.76), the social and cultural dimension 23 items (Cronbach Alpha: 0.89), and the institutional, educational and political dimension 30 items (Cronbach Alpha: 0.96).

For each dimension, the respondents were asked to report the degree to which the practices, initiatives or projects were implemented in the university, polytechnic, faculty, department or school assessed. The five options of response were: (1) not implemented, not designed and not relevant to our HEI; (2) not implemented, not designed but relevant to our HEI; (3) there is at least one project in the SD area, but only in the project stage; (4) there is at least one project in the SD area and it is being implemented; (5) there is at least one project in the SD area and it is already fully implemented.

The questionnaire also includes two additional sections. The first asked respondents to indicate which rankings, certifications and declarations the HEIs had adhered to. The second requested some demographic information about the respondents (e.g. position held, seniority in the position held).

The questionnaire was then sent to the HEIs. An email invitation was sent to each participant following confirmation of the email address of the institution's leaders (university rectors, polytechnic presidents, and directors of departments, faculties or schools). The first email requesting participation in the study was sent on 1st June 2016. A reminder was sent on 15th June followed by a phone call. On 1st July, a further reminder was sent. This phase was completed between June and July 2016. The questionnaire required approximately fifteen minutes to complete all items. The LimeSurvey software (<https://www.limesurvey.org/>) was used to develop and administer the questionnaire. Tokens were introduced for each participant to encourage people to answer the questionnaire.

3.2. Sample

This study considered all the universities and polytechnics in the Portuguese network of public HEIs. Therefore, the questionnaires targeted the leaders of Public Portuguese HEIs (rectors or presidents of each Portuguese public HEIs, and the directors of departments, faculties or schools). The survey was sent to 239 leaders, 34 of whom were rectors or presidents of HEIs and 205 directors of departments, faculties or schools. The sample includes 53 leaders, 18 (34%) of whom are rectors or presidents, and 35 (66%) are directors of departments, faculties or schools (see Table 3). The overall response rate of the study is 22.2%.

Table 3 – Sample distribution

	Rectors or presidents		Directors of departments, faculties or schools		Total	
	N	%	N	%	N	%
Polytechnics	14	26.4%	22	41.5%	36	67.9%
Universities	4	7.5%	13	0	17	32.1%
Total	18	34.0%	35	66.0%	53	100.0%

3.3. Leaders' seniority

Respondents were also asked about their seniority in the job. The analysis of the HEI leaders' seniority revealed most were in 1 to 5-year group; this applied to both rectors/presidents (N = 10), and directors of departments, faculties, and schools (N = 23).

Table 4 – Global leaders seniority

	Rectors or presidents		Directors of departments, faculties or schools		Total	
	N	%	N	%	N	%
Less than 1 year	6	33.33%	4	11.43%	10	18.87%
1 to 5	10	55.56%	23	65.71%	33	62.26%
6 to 10	2	11.11%	5	14.29%	7	13.21%
More than 10 years	0	0.00%	3	16.67%	3	5.66%
Total	18	100.00%	35	100.00%	53	100.00%

3.4. Statistical analysis

Descriptive statistics were used to describe the degree of implementation of SD practices in Portuguese HEIs, namely, frequency distribution tables and the mode (central tendency estimate). The Fisher's exact test was used (considering a significance level of 5%; Fisher, 1990) to analyze whether there were differences between the implementation of SD practices by polytechnics and universities, and between the information provided by rectors/presidents (central services) and by directors of departments, faculties or schools (decentralized services).

Two procedures were implemented to study the stage of SD implementation in the Portuguese HEIs. First, scores for the four SD dimensions were calculated through the mean of the responses for each dimension (factor analysis was not used in this procedure due to the small sample size). Second, a cluster analysis was used to “classify” the HEIs in the different stages of SD implementation. The cluster analysis is suitable for this propose because it “classifies objects (e.g., respondents, ...) so that each object is similar to others in the cluster based on a set of selected characteristics” (Hair *et al.*, 2006). The cluster analysis was performed with the complete-linkage method and the Squared Euclidean distance (other methods and distance measures were also tested). The number of clusters was obtained from observation of the dendrogram.

4. Results

This chapter is organized in five descriptive sections. The first section presents the results from the implementation of SD practices, initiatives or projects in HEIs according to the four dimensions of SD (environmental, economic, social and cultural, and institutional, educational and political). The second section describes the differences in the implementation of SD between polytechnics and universities. This is followed by the differences between the implementation of SD practices according to rectors/presidents (central administration) and directors of departments, faculties and schools (decentralized services and organizational units) in the third section. Section four describes the adherence of Portuguese HEIs to international rankings, certifications and the signature of declarations on SD and/or Education for Sustainable Development (ESD). Finally, the last section presents the stages of SD implementation practices in the Portuguese HEIs.

4.1. Implementations of SD practices, initiatives or projects in HEIs

4.1.1. Environmental dimension

Table 5 presents the absolute and relative frequencies of the responses to items related to the environmental dimension. The practice most recognized by respondents as implemented in campus operations is separation of waste and its forwarding for recycling (e.g., paper, plastic, metal, oils, batteries) with 50.9% of HEIs having implemented it fully. The second most implemented environmental practice/project is the existence of plans to reduce the production of waste (e.g., paper, plastic, metal, oils, batteries), with 28.3% having implemented it fully, and 39.6% in the implementation phase.

The third most implemented practice/project (considering the statistical mode as informant) is the use of energy efficient equipment (e.g., efficient heaters, solar panels, energy saving light bulbs) with 18.9% having implemented it fully, and 34% in the implementation phase.

Regarding practices promoting efficient water consumption (e.g., taps with timer function, flushes with less water, making use of rainwater), 22.6% of the HEIs had already fully implemented them and 34% are in the implementation phase; on the other hand, 37.7% say that this practice is not implemented, not designed but relevant to their HEIs.

The following practices were mentioned by the majority as not implement, not planned but relevant for HEIs: purchasing organic food for on campus preparation (62.3%), followed by encouraging the reduction of greenhouse gases (56.6%), promoting the use of ecological brands (52.8%), using equipment to generate renewable energy (e.g., sun, wind, waves; 39.6%), encouraging the use of sustainable transport for commuting to campus (e.g., bicycle, public transport, electric vehicles; 37.7%), promoting environmental volunteering activities (35.8%), promoting the reuse of materials (34%), finally promoting the construction of sustainable buildings on campus and the conservation of biodiversity on and around the campus (both with 32.1%). These results reflect the importance that these themes present for the leaders of the institutions, although they are still not considered strategic.

Lastly, a minority of leaders stated the following were not implemented, not planned and not relevant practices: purchasing organic food for on campus preparation (15.1%) and to promoting the use of ecological brands (13.2%).

Table 5 – Implementation of SD practices, initiatives or projects in HEIs on environmental dimension of SD

Environmental Dimension	1		2		3		4		5		Fisher's Exact Test(*)	
	N	%	N	%	N	%	N	%	N	%	Universities vs. Polytechnics	Central vs. Decentralized services
A1. Promotes the construction of sustainable buildings on campus	5	9.4	17	32.1	11	20.8	10	18.9	10	18.9	0.441	0.991
A2. Promotes the conservation of biodiversity on and around the campus	4	7.5	17	32.1	9	17	14	26.4	9	17	0.960	0.981
A3. Promotes environmental volunteering activities	3	5.7	19	35.8	12	22.6	10	18.9	9	17	0.408	0.039
A4. Promotes the separation of waste and its forwarding for recycling (e.g., paper, plastic, metal, oils, batteries)	1	1.9	4	7.5	6	11.3	15	28.3	27	50.9	0.501	0.603

A5. Makes plans to reduce the production of waste (e.g., paper, plastic, metal, oils, batteries)	1	1.9	11	20.8	5	9.4	21	39.6	15	28.3	0.159	0.501
A6. Promotes practices to reduce water consumption (e.g., taps with timer function, flushes with less water, making use of rainwater)	1	1.9	20	37.7	7	13.2	13	24.5	12	22.6	0.310	0.578
A7. Uses equipment to generate renewable energy (e.g., sun, wind, waves)	4	7.5	21	39.6	9	17	6	11.3	13	24.5	0.230	0.164
A8. Uses energy efficient equipment (e.g., efficient heaters, solar panels, energy saving light bulbs)	5	9.4	13	24.5	7	13.2	18	34	10	18.9	0.872	0.075
A9. Promotes the reuse of materials	3	5.7	18	34	8	15.1	13	24.5	11	20.8	0.291	0.380
A10. Encourages the reduction of greenhouse gases	4	7.5	30	56.6	8	15.1	3	5.7	8	15.1	0.309	0.887
A11. Encourages the use of sustainable transport for commuting to campus (e.g., bicycle, public transport, electric vehicles)	5	9.4	20	37.7	9	17	12	22.6	7	13.2	0.548	0.735
A12. Promotes the use of ecological brands	7	13.2	28	52.8	6	11.3	5	9.4	7	13.2	0.536	0.119
A13. Purchases organic food for on campus preparation	8	15.1	33	62.3	5	9.4	3	5.7	4	7.5	0.566	0.514

Notes: 1 – Not implemented, not planned and not relevant, 2 – Not implemented, not planned but relevant, 3 – Yes there is, but only in the planning phase, 4 – Yes there is, but only in the implementation phase and 5 – Yes there is and it is fully implemented. (*) Exact Sig. (2-sided).

4.1.2. Economic dimension

Regarding the absolute and relative frequencies of the responses to the economic dimension (table 6) two practices are most recognized by respondents that have been implemented, namely promoting the provision of services to the community, with 73.6% of HEIs having fully implemented this, followed by the promotion of cost reduction in all activities, with 71.1%. The next two most recognized economic practices are demonstrating concern about their economic performance, with 54.7%, and competing in national and international projects to be self-financed, with 50.9% of full implementation.

The following economic practices are in the implementation phase in the majority of HEIs (and have already been implemented in several HEIs): fostering the management and improvement of processes (43.4% in the implementation phase) and making plans to improve their energy efficiency (34% in the implementation phase).

Regarding practices that promote the purchase of food products from local/regional suppliers, these are fully implemented in 28.3% of HEIs and are in the implementation phase in 22.6% of HEIs; in contrast, 28.3% say that this practice is not implemented, not designed but relevant to their HEIs, and 13.2% say that this practice is not even relevant for HEIs.

The least implemented economic practices in Portuguese HEIs are: having a budget for practices promoting SD, having a shop/space for the sale of products produced on campus and benefiting from donations and private funding (e.g., Alumni, companies, organizations). For instance, a minority of leaders mentioned that they had not implemented or planned to have a shop/space for the sale of products produced on campus and it was not a relevant practice (22.6%).

Table 6 – Implementation of SD practices, initiatives or projects in HEIs in the economic dimension of SD

Economic Dimension	1		2		3		4		5		Fisher's Exact Test(*)	
	N	%	N	%	N	%	N	%	N	%	Universities vs. Polytechnics	Central vs. Decentralized services
E1. Demonstrates concern about its economic performance	0	0	3	5.7	11	20.8	10	18.9	29	54.7	0.839	0.575
E2. Makes plans to improve its energy efficiency	1	1.9	9	17	10	18.9	18	34	15	28.3	0.969	0.759
E3. Fosters the management and improvement of processes	2	3.8	2	3.8	6	11.3	23	43.4	20	37.7	0.147	0.664
E4. Competes in national and international projects to be self-financed	0	0	8	15.1	6	11.3	12	22.6	27	50.9	0.181	0.670
E5. Promotes the provision of services to the community	0	0	5	9.4	2	3.8	7	13.2	39	73.6	0.234	0.849
E6. Promotes the purchasing of food products from local/regional suppliers	7	13.2	15	28.3	4	7.5	12	22.6	15	28.3	0.125	0.543
E7 Develops supplier selection criteria for the promotion of fair trade	7	13.2	20	37.7	6	11.3	8	15.1	12	22.6	0.434	0.487
E8. Always promotes cost reduction in all its activities	0	0	3	5.7	1	1.9	11	20.8	38	71.7	0.235	0.785
E9. Benefits from donations and private funding (e.g., Alumni, companies, organizations)	8	15.1	22	41.5	8	15.1	9	17	6	11.3	0.004	0.077
E10. Has a shop/space for the sale of products produced on campus	12	22.6	22	41.5	7	13.2	6	11.3	6	11.3	0.332	0.323
E11. Has a budget for practices promoting SD	6	11.3	32	60.4	7	13.2	5	9.4	3	5.7	0.208	0.882

Notes: 1 – Not planned and not relevant, 2 – Not implemented, not planned but relevant, 3 – Yes there is, but only in the planning phase, 4 – Yes there is, but only in the implementation phase and 5 – Yes there is and it is fully implemented. (*) Exact Sig. (2-sided)

4.1.3. Social and cultural dimension

Table 7 presents the absolute and relative frequencies of the responses to items related to the social and cultural dimension. Results suggest a high degree of implementation of the SD social and cultural practices with HEIs making a great effort with regards SD. More than 75% of HEIs referred the following practices as being fully implemented: fostering the professional and personal development and valorization of employees (e.g., vocational training, academic training); having a canteen and food service; offering students residence services; offering students support services (e.g., pedagogical, psychological, student reception and integration support); fostering the sharing of installations, facilities and human resources; promoting cultural or scientific initiatives targeting the outside community (e.g., open day, science week); and developing and participating in recreational, cultural or sports activities (e.g., sports events).

Few practices are mentioned as not relevant for HEIs. Having on-campus community vegetable gardens is the exception and was mentioned by only 24.5% of the HEIs.

Table 7 –Implementation of SD practices, initiatives or projects in HEIs in the social and cultural dimension of SD

Social and Cultural Dimension	1		2		3		4		5		Fisher's Exact Test(*)	
	N	%	N	%	N	%	N	%	N	%	Universities vs. Polytechnics	Central vs. Decentralized services
S1. Promotes good practices in human resources management	0	0	4	7.5	6	11.3	13	24.5	30	56.6	0.785	0.559
S2. Fosters policies promoting equality and diversity	1	1.9	6	11.3	5	9.4	10	18.9	31	58.5	0.857	0.668
S3. Offers benefits and incentives to employees (e.g. for birthdays)	2	3.8	13	24.5	2	3.8	11	20.8	25	47.2	0.739	0.326
S4. Fosters the reconciliation of professional and personal life	2	3.8	10	18.9	4	7.5	18	34	19	35.8	0.594	0.241
S5. Offers child support systems for employees' children	4	7.5	25	47.2	4	7.5	10	18.9	10	18.9	0.178	0.739
S6. Fosters the professional and personal development and valorization of employees (e.g. vocational training, academic training)	0	0	3	5.7	3	5.7	6	11.3	41	77.4	0.253	0.597
S7. Has a canteen and food service	0	0	1	1.9	1	1.9	3	5.7	48	90.6	0.215	0.803
S8. Promotes initiatives and activities for the development of a healthy lifestyle	2	3.8	9	17	7	13.2	18	34	17	32.1	0.798	0.546
S9. Offers occupational health services (e.g. medical services for all the academic community)	4	7.5	12	22.6	2	3.8	5	9.4	30	56.6	0.467	0.228

S10. Offers student residence services	3	5.7	3	5.7	1	1.9	4	7.5	42	79.2	0.450	0.609
S11. Promotes the employability of students and graduates and insertion in the labor market (e.g. Employment Portal; Services and Office for Work Placements and Professional Guidance)	0	0	1	1.9	3	5.7	13	24.5	36	67.9	1.000	0.923
S12. Promotes Ex-Student networks (e.g., Alumni Network; Employment Observatory; Professional Insertion Observatory; Ex-Students Association)	1	1.9	4	7.5	8	15.1	12	22.6	28	52.8	0.609	0,290
S13. Offers financial and non-financial support and incentive programs to students in addition to the standard services	1	1.9	12	22.6	4	7.5	7	13.2	29	54.7	0.545	0.748
S14. Offers student support services (e.g. pedagogical, psychological, student reception and integration support)	0	0	1	1.9	2	3.8	8	15.1	42	79.2	1.000	0.249
S15. Promotes training activities in transversal skills for students, not mandatory in course curricula (Soft skills)	1	1.9	1	1.9	3	5.7	12	22.6	36	67.9	0.411	0.119
S16. Fosters the sharing of installations, facilities and human resources	2	3.8	0	0	2	3.8	8	15.1	41	77.4	0.634	0.296
S17. Promotes cultural or scientific initiatives targeting the outside community (e.g., open day, science week)	0	0	0	0	1	1.9	7	13.2	45	84.9	0.188	0.790
S18. Develops and participates in recreational, cultural or sports activities (e.g. sports events)	0	0	4	7.5	1	1.9	8	15.1	40	75.5	0.667	0.787
S19. Fosters the promotion of the cultural and artistic heritage	1	1.9	1	1.9	4	7.5	11	20.8	36	67.9	0.792	0.414
S20. Has on-campus community vegetable gardens	13	24.5	17	32.1	6	11.3	7	13.2	10	18.9	0.881	0.015
S21. Fosters concern and initiatives for social inclusion	1	1.9	5	9.4	3	5.7	15	28.3	29	54.7	0.199	0.816
S22. Provides suitable access and installations for the disabled	1	1.9	2	3.8	4	7.5	12	22.6	34	64.2	0.749	0.329
S23. Promotes social solidarity initiatives	0	0	2	3.8	6	11.3	11	20.8	34	64.2	0.614	0.956

Notes: 1 – Not implemented, not planned and not relevant, 2 – Not implemented, not planned but relevant, 3 – Yes there is, but only in the planning phase, 4 – Yes there is, but only in the implementation phase and 5 – Yes there is and it is fully implemented. (*) Exact Sig. (2-sided)

4.1.4. Institutional, educational and political dimension

The institutional, educational and political dimension of SD in HEIs included items such as: SD included in the HEIs' mission, vision and values, strategic plans for SD, communicating SD activities, promoting the education of lecturers and professors in SD, and optative or mandatory curricula units on SD. The results of this dimension (Table 8) show great dispersion, with the same item having high levels of implementation in some HEIs and low level/no implementation in others. Nevertheless, the results of Table 8 clearly demonstrate that HEIs are concerned about ethical issues (e.g., code of ethics or code of behavior, ethics commission), and have transdisciplinary research units/centers; both these practices are fully implemented in 54.7% of HEIs. The majority of HEIs also encourage the development of systemic and holistic thinking in teaching and research, these practices are implemented in 50.9% of HEIs. More than 40% of the HEIs fully implement practices related with the inclusion of SD questions in the mission, vision and values of the HEIs (49.1%), offering optative curricular units on SD in some courses (45.3%), having scientific publications in the area of SD (45.3%), including SD concerns in the strategic plans and objectives (43.4%), and offering post-graduations, masters or doctorates in the SD area (41.5%).

The following topics have a lower level of full implementation and yet have implementation percentages above 35%: organizing seminars or workshops on SD (39.6%), conducting R&D projects on SD (39.6%), and communicating SD activities (37.7%).

Next come practices that, although not implemented, not planned but considered relevant by most HEIs, are already implemented or at least in the implementation stage in a considerable number of other HEIs. This is the case of mandatory curricular units on SD in some courses (39.6% not implemented, not planned but relevant/ 34% fully implemented), having degrees in the area of SD (32.1%/28.3%), promoting the development of technologies and registering patents in the area of SD (34%/32.1%), promoting student participation in on-campus SD activities (24.5%/22.6%), SD is taken into account in the institution's quality and evaluation procedures (26.4%/22.6%).

Although not implemented or planned, leaders consider it relevant to have mandatory curricular units on SD in all courses (50.9%) and a department responsible for SD in the organization chart (50.9%). In terms of SD communication, publishing sustainability reports is also considered relevant even though this is not implemented or projected (49.1%). Given the aims of this research and subsequent discussion of results, it should be noted that there were high response

frequencies on the not implemented, not planned but relevant option in questions such as elective curricular units on SD in all courses (49.1%), organizing courses in partnership with other educational institutions in the area of SD (45.3%), having an SD research unit/center (43.4%), having human resources whose work is to promote SD (41.5%), developing formal regional, national or international partnerships with a view to promoting SD (39.6%), organizing seminars or workshops on SD (39.6%), conducting projects with other higher education institutions in the area of SD (35.8%), promoting education on SD for teachers (34%), belonging to national and/or international networks for SD (e.g., UES4D), and promoting participation of (teaching and non-teaching) staff in on-campus SD activities .

A minority of practices were considered not relevant for HEIs; these are mainly related with having degrees, curricular units, or research units in the SD area.

Table 8 – Implementation of SD practices, initiatives or projects in HEIs in institutional, educational and political dimension of SD

Institutional, Educational and Political Dimension	1		2		3		4		5		Fisher's Exact Test(*)	
	N	%	N	%	N	%	N	%	N	%	Universities vs. Polytechnics	Central vs. Decentralized services
I1. SD questions are included in the mission, vision and values of the HEI	1	1.9	6	11.3	3	5.7	17	32.1	26	49.1	0.925	0.659
I2. The strategic plans and objectives include concerns about SD	1	1.9	4	7.5	4	7.5	21	39.6	23	43.4	0.670	0.597
I3. Communicates SD activities	1	1.9	6	11.3	8	15.1	18	34	20	37.7	0.900	0.847
I4. Publishes sustainability reports	1	1.9	26	49.1	16	30.2	6	11.3	4	7.5	0.514	0.726
I5. Demonstrates concern about ethical issues (e.g., code of ethics or code of behavior, ethics commission)	1	1.9	6	11.3	4	7.5	13	24.5	29	54.7	0.910	0.538
I6. Promotes education on SD for teachers	3	5.7	18	34	13	24.5	8	15.5	11	20.8	0.947	0.968
I7. Organizes courses in partnership with other educational institutions in the area of SD	4	7.5	24	45.3	9	17	4	7.5	12	22.6	0.835	0.667
I8. There are optative curricular units on SD in some courses	6	11.3	16	30.2	3	5.7	4	7.5	24	45.3	0.123	0.666
I9. There are optative curricular units on SD in all courses	13	24.5	26	49.1	7	13.2	3	5.7	4	7.5	0.407	0.886
I10. There are mandatory curricular units on SD in some courses	6	11.3	21	39.6	5	9.4	3	5.7	18	34	0.546	0.264
I11. There are mandatory curricular units on SD in all courses	17	32.1	27	50.9	3	5.7	4	7.5	2	3.8	0.774	0.978

I12. There are degrees in the area of SD	16	30.2	17	32.1	3	5.7	2	3.8	15	28.3	0.021	0.777
I13. There are post-graduations, masters or doctorates in the area of SD	13	24.5	16	30.2	1	1.9	1	1.9	22	41.5	0.053	0.410
I14. Encourages the development of systemic and holistic thinking in teaching and research	2	3.8	6	11.3	8	15.1	10	18.9	27	50.9	0.608	0.804
I15. Enables students, professors and staff to do exchange programs in the area of SD	6	11.3	15	28.3	6	11.3	9	17	17	32.1	0.218	0.620
I16. There is an SD research unit/center	12	22.6	23	43.4	5	9.4	4	7.5	9	17	0.001	0.639
I17. There are transdisciplinary research units/centers	5	9.4	6	11.3	3	5.7	10	18.9	29	54.7	0.170	0.671
I18. Has scientific publications in the area of SD	8	15.1	13	24.5	4	7.5	4	7.5	24	45.3	0.040	0.525
I19. Organizes seminars or workshops on SD	6	11.3	14	26.4	8	15.1	4	7.5	21	39.6	0.021	0.434
I20. There is a multidisciplinary structure to promote research and education in sustainability	7	13.2	21	39.6	5	9.4	8	15.1	12	22.6	0.016	0.709
I21. Conducts R&D projects on SD	7	7	14	26.4	7	13.2	4	7.5	21	39.6	0.041	0.913
I22. Promotes the development of technologies and registers patents in the area of SD	7	7	18	34	7	13.2	4	7.5	17	32.1	0.004	0.847
I23. Belongs to national and/or international networks for SD (e.g., UES4D)	10	10	17	32.1	8	15.1	7	13.2	11	20.8	0.085	0.931
I24 Has a department responsible for SD in its organization chart	12	12	27	50.9	6	11.3	4	7.5	4	7.5	0.544	0.792
I25. Its organization chart includes human resources whose work is to promote SD	13	13	22	41.5	6	17	4	7.5	5	9.4	0.666	0.767
I26. Promotes student participation in on-campus SD activities	4	4	13	24.5	11	20.8	13	24.5	12	22.6	0.127	0.648
I27. Promotes participation of (teaching and non-teaching) staff in on-campus SD activities	4	4	16	30.2	8	15.1	14	26.4	11	20.8	0.084	0.744
I28. SD is taken into account in the institution's quality and evaluation procedures	5	5	14)	26.4	12	22.6	10	18.9	12	22.6	0.162	0.582
I29. Conducts projects with other higher education institutions in the area of SD	4	4	19	35.8	6	11.3	11	20.8	13	24.5	0.164	0.281
I30. Develops formal regional, national or international partnerships with a view to promoting SD	4	4	21	39.6	4	7.5	9	17	15	28.3	0.061	0.933

Notes: 1 – Not implemented, not planned and not relevant, 2 – Not implemented, not planned but relevant, 3 – Yes there is, but only in the planning phase, 4 – Yes there is, but only in the implementation phase and 5 – Yes there is and it is fully implemented. (*) Exact Sig. (2-sided).

4.2. Differences between polytechnics and universities in the implementation of SD practices

In the majority of the SD practices, there are no significant differences between universities and polytechnics (see the Fisher's Exact Test on the tables above). However, there are eight practices that emerge with significant differences ($p\text{-value} < 0.05$) between institutions, one from the economic dimension and seven from the institutional, educational and political dimension. Table 9 presents the answers for this practices in each kind of institution.

It is possible to observe that while universities are already benefiting from donations and private funding, or are in the phase of implementing this kind of project, polytechnics are delaying such projects or are having difficulties in implementing them (some even state that this practice is not relevant). The existence of degrees in the SD area, having a research unit/center on SD, having publications on SD, organizing seminars or workshops on SD, and the development of technologies and the registration of patents in the SD area are implemented much more (or in the phase of implementation) in universities than in the polytechnics. Some polytechnics even state that some practices are not relevant (e.g., 14 polytechnics mentioned that it is not relevant to have a degree in the SD area).

Table 9 – Differences between polytechnics and universities in the implementation of SD practices (for practices with significant statistical differences)

SD practices		Type of higher education institution			
		Polytechnic		University	
		N	%	N	%
E9 Benefits from donations and private funding (e.g., Alumni, companies, organizations)	1	5	13.9%	3	17.6%
	2	20	55.6%	2	11.8%
	3	6	16.7%	2	11.8%
	4	3	8.3%	6	35.3%
	5	2	5.6%	4	23.5%
I12 There are degrees in the area of sustainable development	1	14	38.9%	2	11.8%
	2	12	33.3%	5	29.4%
	3	3	8.3%	0	0.0%
	4	0	0.0%	2	11.8%
	5	7	19.4%	8	47.1%
I16 There is a sustainable development research unit/center	1	9	25.0%	3	17.6%
	2	19	52.8%	4	23.5%
	3	5	13.9%	0	0.0%
	4	2	5.6%	2	11.8%
	5	1	2.8%	8	47.1%
I18 Has scientific publications in the area of sustainable development	1	7	19.4%	1	5.9%
	2	11	30.6%	2	11.8%

	3	3	8.3%	1	5.9%
	4	4	11.1%	0	0.0%
	5	11	30.6%	13	76.5%
I19 Organizes seminars or workshops on sustainable development	1	5	13.9%	1	5.9%
	2	13	36.1%	1	5.9%
	3	6	16.7%	2	11.8%
	4	3	8.3%	1	5.9%
	5	9	25.0%	12	70.6%
I20 There is a multidisciplinary structure to promote research and education in sustainability	1	6	16.7%	1	5.9%
	2	17	47.2%	4	23.5%
	3	5	13.9%	0	0.0%
	4	3	8.3%	5	29.4%
	5	5	13.9%	7	41.2%
I21 Conducts R&D projects on sustainable development	1	6	16.7%	1	5.9%
	2	12	33.3%	2	11.8%
	3	6	16.7%	1	5.9%
	4	3	8.3%	1	5.9%
	5	9	25.0%	12	70.6%
I22 Promotes the development of technologies and registers patents in the area of sustainable development	1	6	16.7%	1	5.9%
	2	16	44.4%	2	11.8%
	3	6	16.7%	1	5.9%
	4	2	5.6%	2	11.8%
	5	6	16.7%	11	64.7%

Note: 1 – Not implemented, not planned and not relevant, 2 – Not implemented, not planned but relevant, 3 – Yes there is, but only in the planning phase, 4 – Yes there is, but only in the implementation phase and 5 – Yes there is and it is fully implemented.

4.3. Differences between the way rectors/presidents (central services) and directors of departments, faculties or schools (decentralized services) interpret the implementation of SD practices

In most SD practices, there are no significant differences between the vision of the central services (rectors or presidents) and that of the decentralized services (directors of departments, faculties or schools). There are only two practices with significant differences ($p\text{-value} < 0.05$), one from the environmental dimension and the other from the social and cultural dimension. Table 10 presents the answers regarding these practices in each level of analysis. Except for these two examples, there are no evidences of the informational asymmetry between the central and decentralized services.

The two differences emerge in practices related to the promotion of environmental volunteering activities and the existence of on-campus community vegetable gardens. Although there are significant differences between levels of analysis (centralized vs decentralized services), the

pattern of responses is irregular. Nevertheless, it is possible to observe that the promotion of environmental volunteering activities is implemented more (or is in the implementation phase) in the departments, faculties or schools. Regarding on-campus community vegetable gardens, the central services of universities/polytechnics mention that this practice is being planned or implemented; however, several departments, faculties or schools are not in that phase and some say it is not relevant (on the other hand, seven departments, faculties or schools mentioned they had already implemented it).

Table 10 – Differences between rectors/presidents (central services) and directors of departments, faculties or schools (decentralized services) on the implementation of SD practices (for practices with significant statistical differences)

SD practices		Central services (rectors/presidentes)		Decentralized services (directors of departments, faculties or schools)	
		N	%	N	%
A3 Promotes environmental volunteering activities	1	0	0.0%	3	8.6%
	2	7	38.9%	12	34.3%
	3	8	44.4%	4	11.4%
	4	1	5.6%	9	25.7%
	5	2	11.1%	7	20.0%
S20 Has on-campus community vegetable gardens	1	4	22.2%	9	25.7%
	2	2	11.1%	15	42.9%
	3	5	27.8%	1	2.9%
	4	4	22.2%	3	8.6%
	5	3	16.7%	7	20.0%

4.4. Rankings, certifications and declarations

In relation to rankings (Table 11), 43.4% referred that the HEI belongs to some national or international ranking (44.4% for rectors or presidents and 42.9% for directors of faculties, departments and schools). Overall and based on the 23 HEIs that belong to at least one ranking, HEIs belong mainly to the following rankings: U-Multirank (82.6%), Scimago (34.8%), and the Times Higher Education (26.1%).

Table 11 – Rankings

Rankings		N	%
HEI belongs to some national or international ranking	No	30	56.6%
	Yes	23	43.4%
R1 Belongs to the Greenmetric of World Universities (GreenMetric)	No	22	95.7%
	Yes	1	4.3%

R2 Belongs to the Times Higher Educations (THE)	No	17	73.9%
	Yes	6	26.1%
R3 Belongs to the Leiden	No	19	82.6%
	Yes	4	17.4%
R4 Belongs to the Global Research University Profile	No	22	95.7%
	Yes	1	4.3%
R5 Belongs to the Scimago	No	15	65.2%
	Yes	8	34.8%
R6 Belongs to the U-Multirank	No	4	17.4%
	Yes	19	82.6%
R7 Belongs to the Quacquareli Symonds - University World Rankings (QS)	No	21	91.3%
	Yes	2	8.7%
R8 Belongs to the QS World University Rankings	No	20	87.0%
	Yes	3	13.0%
R9 Belongs to the Webmetrics	No	18	78.3%
	Yes	5	21.7%
R10 Belongs to the Shangai Academic Ranking of World Universities (ARWU)	No	19	82.6%
	Yes	4	17.4%

As for certifications, 20 (37.7%) of the respondents stated that their HEI has at least one certification (Table 12). The Quality Management System ISO 9001 is the most recognized in the certifications listed, with 16 (80%) HEIs being certified. Only a few HEIs have certifications in more specific areas: two HEIs in a Management System for Social Responsibility (NP-4469-1:2008 that take into account the ISO 26000), one HEI in the Environmental Management System (ISO 14001), one HEI in the Food Management Systems (ISO 22000), and another in the Information Security Management System (ISO 27001).

No HEI reported being certified by the following: Graphical Assessment of Sustainability in Universities System; Community Eco-management and Audit Schemes; Monitoring and Evaluation System for Social Responsibility; Energy Management System; and Sustainable Events System or FSC Certification (Forests for all forever).

In addition to these certifications, two respondents reported having certification from the Agency for Assessment and Accreditation of Higher Education in Portugal (A3ES).

Table 12 - Certifications

Certifications		N	%
HEI has at least one certification	0 No	33	62.3%
	1 Yes	20	37.7%
C1 Graphical Assessment of Sustainability in Universities System (GASU)	No	20	100.0%
C2 Quality Management System (ISO 9001)	No	4	20.0%
	Yes	16	80.0%
C3 Environmental Management System (ISO 14001)	No	19	95.0%
	Yes	1	5.0%

C4 Community Eco-management and Audit Scheme (EMAS)	No	20	100.0%
C5 Monitoring and Evaluation System for Social Responsibility	No	20	100.0%
C6 Management System for Social Responsibility (NP-4469-1:2008 and/or ISO 26000)	No	18	90.0%
	Yes	2	10.0%
C7 Energy Management System (ISO 50001)	No	20	100.0%
C8 Food Management Systems (ISO 22000)	No	19	95.0%
	Yes	1	5.0%
C9 Sustainable Events System (ISO 20121)	No	20	100.0%
C10 Information Security Management System (ISO 27001)	No	19	95.0%
	Yes	1	5.0%
C11 FSC Certification	No	20	100.0%

Only six HEIs (11.3%; Table 13) signed declarations for SD or EDS. Regarding the declarations presented in the questionnaire, the results showed that only two HEIs (33.3%) belong to the Group of Reflection and Support for Corporate Citizenship (GRACE) and the National Network of Social Responsibility of Organizations (RSO.PT).

Table 13 – Declaration for SD or EDS

Declarations		N	%
The HEI signed at least one declaration for SD or ESD	No	47	88.7%
	Yes	6	11.3%
D1 Signed the PRiME Principles (PRiME)	No	5	83.3%
	Yes	1	16.7%
D2 Belongs to Group of Reflection and Support for Corporate Citizenship (GRACE)	No	4	66.7%
	Yes	2	33.3%
D3 Belongs to National Network of Social Responsibility of Organizations (RSO.PT)	No	4	66.7%
	Yes	2	33.3%
D4 Belongs to Copernicus letter	No	6	100.0%
D5 Belongs to UE4SD	No	5	83.3%
	Yes	1	16.7%

4.5. The stages of SD implementation practices in the Portuguese HEIs

As mentioned in section 3.4, scores were calculated for each of the SD dimensions. A cluster analysis was performed for the four SD scores. Five clusters/groups were extracted through the observation of the dendrogram, and then compared in terms of implementation practices (Table 14). The Kruskal-Wallis H-test was used to compare the five groups. There are significant differences between groups ($p\text{-value} < 0.05$), which suggests a real difference in SD practices implemented in the HEIs' groups.

In the first group, six (11%) HEIs (four universities, two polytechnics) have already fully implemented a high level of SD practices (on average 52.67 SD practices were implemented out of a maximum of 77 listed). This group of HEIs has the highest levels of SD practices implemented in the economic, social and institutional areas; the environmental dimension also shows a good

performance (Table 14 and Figure 1). Five of these six HEIs belong to at least one ranking related with SD. Despite this good performance in SD practices, projects, and rankings, just two institutions have certifications and only one has signed a declaration related to SD. In the group of Portuguese HEIs under analysis, these could be seen as the “innovators” in the implementation of SD practices.

In the second group, ten (19%) HEIs (two universities and eight polytechnics) have fully implemented around 46% of the SD practices listed (an average of 35.70 out of 77). These HEIs show a very good performance in the social dimension, and a good performance in the environmental, economic and institutional dimensions. In this group 40% of the HEIs have at least one certification and 60% belong to at least one SD ranking, but none signed declarations in the SD area. This group could be seen as the “early adopters” of SD practices in HEIs.

In the third group, 25 (47%) HEIs (seven universities and 18 polytechnics) have fully implemented on average 34% of the SD practices listed (an average of 26.28 out of 77). In these HEIs, the social dimension is well developed, the economic dimension is reasonably developed, and the environmental and institutional dimensions have considerable weaknesses. Nevertheless, eleven HEIs are certified, nine belong to at least one ranking, and two signed declarations related with SD. This group could be interpreted as the “early majority” in terms of SD implementation practices.

In the fourth group, seven (13%) HEIs (three universities and four polytechnics) have fully implemented about 31% of SD practices listed (an average of 24 out of 77). This group is similar to group 3 in the performance of the economic and institutional dimensions, but has a poorer performance in the environmental and social dimensions. Two HEIs have at least one certification, two belong to at least one ranking and two signed at least one SD declaration. This group could be interpreted as the “late majority” in terms of SD implementation practices.

In the fifth and last group, 5 (9%) HEIs (one university and four polytechnics) have fully implemented an average of only about 15% of the SD practices listed (an average of 11.40 out of 77). This group has the lowest levels of SD practices implemented in all the SD dimensions. The institutional dimension has the lowest level of implemented practices. In terms of the implementation of the SD practices, these HEIs could be seen as the “laggards”. Out of these institutions, one HEI has a certification, belong to a ranking and signed a SD declaration (which seems a contradiction). Two situations can justify it. Firstly, top management could be aware of the participation of its HEIs in the ranking, however do not know all the practices carried out in

the different dimensions, or their state of development, either due to lack of information or ineffective communication. Secondly, the motivations for adhering to rankings and signing declarations could be more marketing derived than genuine commitment, because they contribute for a better image of HEI (“greenwashing”), even when the true amount of practices implemented was scarce. For Lauder et al. (2015) university rankings, as Times Qs and Shangai Jiaotong, are influential and are therefore monitored closely by HEIs administrators, industrial leaders, politicians and ministry official.

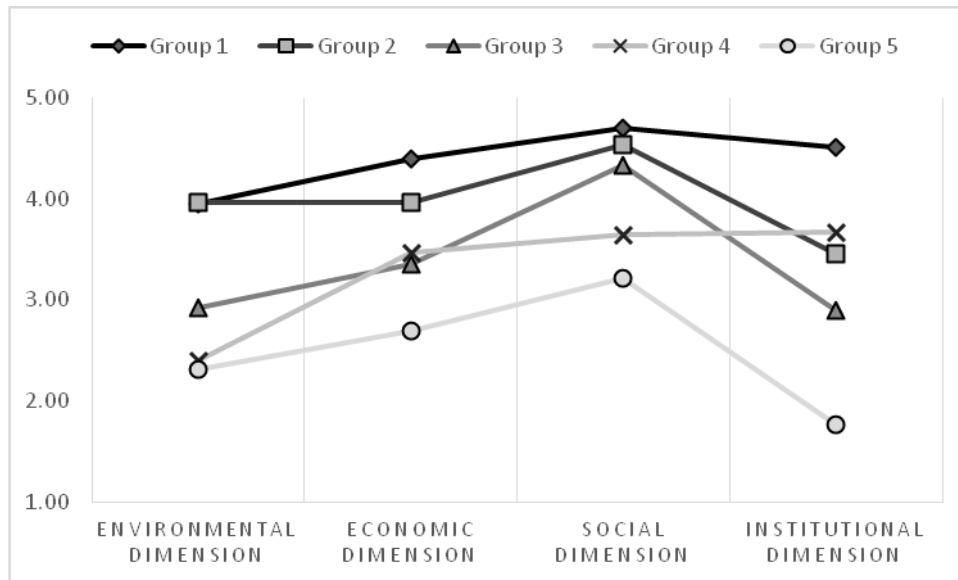
Table 14 - Groups emerging from the cluster analysis

		Group 1	Group 2	Group 3	Group 4	Group 5	Kruskal Wallis Test
		n=6 (11%)	n=10 (19%)	n=25 (47%)	n=7 (13%)	n=5 (9%)	Asymp. Sig.
Environmental dimension (mean)		3.95	3.96	2.92	2.41	2.31	0.000
Economic dimension (mean)		4.39	3.96	3.35	3.47	2.69	0.000
Social and cultural dimension (mean)		4.70	4.54	4.33	3.65	3.21	0.000
Institutional, educational and political dimension (mean)		4.51	3.46	2.89	3.67	1.77	0.000
Number of fully implemented SD practices in each HEI (maximum: 77)	Mean	52.67	35.70	26.28	24.00	11.40	
	Median	46.50	35.50	28.00	23.00	11.00	
	Mode	40	33	19	8	6	
Number of certifications held by HEIs (*)	0	4	6	14	5	4	
	1	2	3	9	1	1	
	2	0	1	2	0	0	
	3	0	0	0	1	0	
Number of rankings to which HEIs belong (*)	0	1	4	16	5	4	
	1	1	3	5	0	1	
	2	2	2	2	1	0	
	3	0	0	1	1	0	
	4	1	0	1	0	0	
	5	0	1	0	0	0	
	10	1	0	0	0	0	
Number of declarations signed on SD (*)	0	5	10	23	5	4	
	1	1	0	2	1	1	
	3	0	0	0	1	0	
Stage of SD implementation proposed		Innovative	Early adopters	Early majority	Late majority	Laggards	
Number of Polytechnics		2 (4%)	8 (15%)	18 (34%)	4 (8%)	4 (8%)	
Number of Universities		4 (8%)	2 (4%)	7 (13%)	3 (6%)	1 (2%)	

Number of HEIs centralized services	4 (8%)	3 (6%)	7 (13%)	2 (4%)	2 (4%)	
Number of faculties, schools and departments	2 (4%)	7 (13%)	18 (34%)	5 (9%)	3 (6%)	

Notes: (*) open-ended answers were also considered (e.g., A3ES certification).

Figure 1 – Means per group for each SD dimension



The implementation phases of SD practices seem to be independent of the type of institution (university or polytechnic) and independent of the level of analysis (central services versus faculties, departments and schools).

5. Discussion

According to Lukman *et al.* (2010), “the implication of environmental issues has received little or no attention at all, although many universities are monitoring their environmental footprint”. In fact, there is still much to be done in the environmental dimension of SD practices. Results indicate that most institutions are starting planning, but only issues relating to waste separation, recycling and waste reduction plans are being fully implemented. Contrary to other studies (e.g., Vagnoni and Cavicchi, 2015; Lozano, 2011) which identified more practices in the environmental dimension, this study suggests that the environmental dimension has a small number of practices in the Portuguese context. There are several barriers that could explain this result. For Vagnoni and Cavicchi (2015), the difficulty of implementing environmental management systems and sustainability on campus is due to the lack of management and staff support. Gonzalez-Gaudiano *et al.* (2016) claim that the lack of commitment from senior management is also a barrier to the implementation of sustainability in HEIs. Reference has also been made to

lack of commitment, initiatives and participation as barriers or obstacles to sustainability in the Portuguese context (Aleixo et al., 2017b).

In most of the Portuguese HEIs, the economic dimension is the second most developed after the social dimension. Institutions report practices such as cost-cutting in all their activities, as well as the promotion of increased self-financing through services to the community and competing for national and international projects. Results suggest that institutions are still trying to overcome the financial difficulties faced in recent years, so are strengthening their policy of reducing costs in their activities, and also incrementing and diversifying alternatives to assure economic sustainability, notably promoting fundraising at the national and international level by competing for research projects. For Lozano (2011) the HEIs tend to focus on the economic dimension in sustainability reports due to the fact that: “The economic dimension might be as a result of utilising the information available in their annual reports.”

The social and cultural dimension is the most developed in the majority of Portuguese HEIs. Practices related to the management and valorization of human resources are positive; this is also the case of services (social, cultural and recreational) that the Institutions make available to the academic community and the surrounding communities.

The development of the institutional, educational and political dimension is ambivalent in Portuguese HEIs as it is the least developed dimension in some HEIs but the most developed in others. This means that there are different patterns of development for these practices. In the institutional dimension of SD, some leaders revealed their institutions have already started to include SD in communications. HEIs seek to communicate SD in institutional terms through their mission, vision and values, strategic plans and objectives, as well as through SD activities and their concern about ethical issues. For Leal Filho *et al.* (2015), over 600 universities worldwide have committed themselves to sustainability by signing international agreements and this compromise could be the catalyst for more systematic action. On the other hand, the analysis by Katiliūtė *et al.* (2014) of the disclosures of sustainability practices through the HEIs websites reveals that the most relevant sustainability issues are those linked to HEIs' profile and governance, such as: mission and vision statements, values, and financial statements, and HEI governance structure.

The results thus strengthen the evidence already seen in Aleixo *et al.* (2016). Therefore, while the literature review accentuates the importance of the environmental dimension in HEIs, our results show that Portuguese HEIs give more emphasis to the economic and social dimensions.

In terms of rankings to which HEIs belong, the respondents' references to the adoption of U-Multirank were confirmed. Although membership of the U-Multirank is voluntary, the indicators depend on information that is external to the institutions and, as a result, there is a marked difference between polytechnics and universities. According to respondents from the group of rectors and presidents, only one HEI belongs to the Green Metric. However, Aleixo *et al.* (2016) found that at least two HEIs belong to this ranking. This may reveal top management of the faculties, departments and schools know little about these issues. According to Shi and Lai (2013), the sustainability ranking systems could contribute to the HEI managers' adoption of SD because they “may help direct the attentions of university administrators towards sustainable development, thus expediting the process of integrating and institutionalizing sustainability into universities globally” (Shi and Lai, 2013). As referred by Cebrian *et al.* (2015) and Lauder *et al.* (2015), ranking HEIs in the area of sustainability could foster a holistic implementation of SD in HEIs, and the Green Metric is a convincing example. According to Cebrian *et al.* (2015) and Lauder *et al.* (2015), the Green Metric could be a tool to integrate sustainability assessment and reporting methods in HEIs. This is also suggested by Grindsted (2011), who states that the Green Metric is the first to reflect HEI behavior on sustainability.

The certifications and assessment tools indicated by the leaders of the Portuguese HEIs originate from corporations and organizational models and were not specific to HEIs (e.g., ISO 9001, GASU). In Disterheft *et al.* (2012), 47 European HEIs had Environmental Management Systems (EMS) on campus, namely in German HEIs; this is not confirmed in the Portuguese context. Although Portuguese HEIs are starting to have some certifications, they are mainly related to the Quality Management Systems (ISO 9001).

Regarding the signing of declarations for SD or ESD, respondents recognize statements such as RSO.PT (see <http://cite.gov.pt/pt/acite/rsopt.html>) and GRACE (see <http://www.grace.pt/>). However, although at least four Portuguese HEIs signed the UE4SD declaration (see <http://www.ue4sd.eu/>), only one institution mentioned it in this study. Larrán Jorge *et al.* (2015) defend that HEIs should give priority to declarations such as the United Nations Global Compact - Principles for Responsible Management Education or the College Sustainability rather than higher education declarations for SD or ESD and, they should foster the creation of research networks on sustainability in universities (e.g., Copernicus Alliance, Regional Center of Expertise on Education for Sustainable Developments).

HEIs with high SD implementation practices were expected to have more certifications and adhere to more rankings and commitment statements on SD or EDS, but this is not what the

results revealed. They denote a compartmentalized implementation of SD in HEIs that is aligned with the findings of Lozano *et al.* (2015) whom results showed that SD in HEIs has been compartmentalized and is not considered holistically. However, and contrarily to Lozano *et al.* (2013b), this study defends that there is not a strong relationship between SD commitment, implementation and the signing of declarations.

It is argued by Larrán Jorge *et al.* (2015) that leadership plays a fundamental role in the implementation of sustainability practices by HEIs, and "leadership may also be a driver when the leader sees transformation as a way to leave his or her legacy to the organisation". Thus, and as advocated by different authors (e.g., Lozano, 2006, Alonso-Almeida *et al.*, 2015, Larrán Jorge *et al.*, 2015) *innovators* can play a critical role as agents of change and drivers of innovation in their organizations and other leaders may follow through a process of imitation (understood as a competitive advantage).

There are no significant differences between institutions from the two subsystems (polytechnic and university) in 90% of the SD practices analyzed; this suggests that both are aware of their responsibility in relation to SD, and have begun to take the first steps in this direction. More practices had been implemented by universities with regards to their capacity to obtain donations and private funds, conducting research or having scientific publications in SD, as well as offering degrees, seminars and workshops in the area of SD. Moreover, in Aleixo *et al.* (2016), Universities revealed a higher percentage of SD practices in all dimensions. Nevertheless, the results also show that SD implementation can vary within each university and polytechnic; this confirms the importance of leadership, in this case of the director of departments, faculties or schools.

The results of the cluster analysis also indicate real differences in the implementation of SD practices in the groups of HEIs. At least 6 HEIs have already fully implemented a high level of practices in the economic, social and institutional dimensions. It can also be seen that, generally speaking, practices related to the environmental dimension have a lower level of implementation than the economic and social practices. This result differs from the findings presented in other countries, namely in Spain where this dimension has a higher value (e.g., Larrán Jorge, 2016; Leon-Fernandez and Domínguez-Vilches, 2015).

HEIs can respond to the challenges of the 21st century by implementing sustainability in their system and subsystem activities, practices and projects. They can foster SD by setting an

example, incorporating on-campus initiatives and educating current and future generations to cope with sustainability challenges.

6. Conclusion, limitations and directions for future research

This work examines how HEIs can promote sustainability through different dimensions of sustainability. Portuguese HEIs are beginning to give relevance to all dimensions of SD and to include it in their strategic plans, communication strategies and policies. However, most practices associated with these dimensions are still in the planning phase. These findings are in line with the state of the art that shows that this concept is still associated with the economic sustainability of institutions (economic dimension). The environmental dimension is essentially related to recycling, waste management and planning. The HEI leaders frequently refer to the inclusion of SD in the curriculum, research and communication of the institutions as being very relevant, although not implemented and/or projected. HEIs play a critical role in promoting SD and the efforts of their leaders are vital for the accomplishment of such goals. HEIs worldwide are responding to this call for leadership by integrating sustainability issues in education, research, operations and outreach and collaboration with the community. HEIs need to recognize their responsibilities in empowering their students with skills to address the problems of society for future wellbeing. HEI leaders must ensure that their staff, faculty and students are able to balance costs and benefits in the four dimensions of SD and foster sustainability of the HEI itself and worldwide with the aim of leading the next generation to global sustainability. As shown in some studies, notably in the Spanish context (e.g., Larran Jorge et al., 2015, 2016), it is important to develop policy statements to increase the sustainability practices in Portuguese HEIs.

The following limitations of the study have been identified with regards the method of obtaining data. Firstly, although the direct invitation method of the survey provided direct access to leaders, the person with the most complete knowledge of sustainability efforts and activities at their institution might not have targeted. Due to the large size of the organizations and even geographical spread, there may be situations where leaders are not aware of practices and projects implemented. In addition, some of the projects and practices implemented in colleges, departments and schools may not be known to the central services and vice versa (because the respondent did not have access to the information, even though this should not be the case). Second, the data were obtained by a questionnaire sent by email; a personal approach could have resulted in a higher response rate but this would have entailed more time and resources than were available. Third, the overall response rate to the questionnaire was 22.2%, which

means that several universities and polytechnics did not give feedback about their SD practices. Fourth, the questionnaire did not have an option for “not applicable/I do not know”, which may have led to more institutions not participating. Lastly, some of the institutions known as having an excellent SD performance in Portugal did not participate.

Following the studies of Too and Bajracharya (2015), Vagnoni and Cavicchi (2015), Jones *et al.* (2013), Sammalisto *et al.* (2015), and Figueredo and Tsarenko (2013), which highlighted the importance of the stakeholders’ perceptions, future research should include other stakeholders (e.g., professors, administrative staff, and students) in the survey, as well as their perceptions about the implementation of practices in the various dimensions of sustainability.

7. References

- Aleixo, A.M., Azeiteiro, U. & Leal, S. (2017a), UN Decade of Education for Sustainable Development: Perceptions of Higher Education Institution’s Stakeholders. In W. Leal Filho, U.M. Azeiteiro, F. Alves, P. Molltan-Hill (Eds.), *Handbook of Theory and Practice of Sustainable Development in Higher Education* (Volume 4, pp.417-428, in the series "World Sustainable Development Series). Berlin: Springer. DOI 10.1007/978-3-319-47877-7. Available at: https://link.springer.com/chapter/10.1007/978-3-319-47877-7_28.
- Aleixo, A.M., Azeiteiro, U.M. and Leal, S. (2016), “Toward Sustainability through Higher Education: Sustainable Development incorporation into Portuguese Higher Education Institutions”, in Davim, J.P. and Leal Filho, W. (Eds.), *Challenges in Higher Education for Sustainability*, Springer, London, pp. 159-187.
- Aleixo, A.M., Leal, S. and Azeiteiro, U.M. (2017b), “Conceptualization of sustainable higher education institutions, roles, barriers, and challenges for sustainability: an exploratory study in Portugal”. *Journal of Cleaner Production*.
- Alonso-Almeida, M.M., Marimon, F., Casani, F. and Rodriguez-Pomeda, J. (2015). "Diffusion of sustainability reporting universities: current situation and future perspectives", *Journal of Cleaner Production*, Vol. 106, pp. 144-154.
- Alshuwaikhat, H. M., and Abubakar, I. (2008), “An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices”, *Journal of Cleaner Production*, 16, 1777 - 1785.
- Amaral, L.P., Martins, N. and Gouveia, J.B. (2015), "Quest for a sustainable university: a review", *International Journal of Sustainability in Higher Education*, Vol. 16, pp. 155-172.
- Cebrian, G., Grace, M. and Humphris, D. (2015), "Academic staff engagement in education for sustainable development", *Journal of Cleaner Production*, Vol. 106, pp. 79-86.
- Cortese, A.D. (2003), "The critical role of higher education in creating a sustainable future", *Planning for Higher Education*, Vol. 31, pp. 15-22.
- DGES - Direcção Geral Do Ensino Superior (2015), *O ensino superior português [The Portuguese higher education]*, available at: <http://www.dges.mctes.pt/DGES/pt> (accessed 10 May 2015).
- Disterheft, A., Caeiro, S., Azeiteiro, U.M. and Filho, W.L. (2013), Sustainability Science and Education for Sustainable Development in Universities: A Way for Transition. In S. Caeiro, W. Leal Filho, C. Jabbour and U.M. Azeiteiro (eds.) *Sustainability Assessment Tools in Higher Education Institutions: Mapping Trends and Good Practices Around the World*. Springer International Publishing: Cardiff, UK, pp. 3-28.
- Disterheft, A., Caeiro, S., Ramos, M. and Azeiteiro, U.M. (2012), "Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions e Top-down versus participatory approaches", *Journal of Cleaner Production*, Vol. 31, pp. 80-90.

- Disterheft, A., Caeiro, S.S., Filho, W.L. and Azeiteiro, U.M. (2016), "The INDICARE-model: measuring and caring about participation in higher education's sustainability assessment", *Ecological Indicators*, Vol. 63, pp. 172–186.
- Dyer, G. and Dyer, M. (2017), "Strategic leadership for sustainability by higher education: the American College & University Presidents' Climate Commitment". *Journal Of Cleaner Production*, Vol. 140 (Part 1), pp.111-116.
- Fischer, D., Jenssen, S. and Tappeser, V. (2015), "Getting an empirical hold of the sustainable university: a comparative analysis of evaluation frameworks across 12 contemporary sustainability assessment tools", *Assessment and Evaluation in Higher Education*, Vol. 40, pp. 785-800.
- Fisher, R. A. (1990). *Statistical Methods, Experimental Design, and Scientific Inference*. Oxford University Press.
- Godemann, J., Bebbington, J., Herzig, C. and Moon, J. (2014), "Higher education and sustainable development: Exploring possibilities for organisational change", *Accounting, Auditing & Accountability Journal*, Vol. 27, pp. 218-233.
- Gómez, F.U., Sáez-Navarrete, C., Lioi, S.R. and Marzuca, V.I. (2015), "Adaptable model for assessing sustainability in higher education", *Journal of Cleaner Production*, Vol. 107, pp. 475-485.
- Gonzalez-Gaudiano, E.J., Meira-Cartea, P.A. and Martínez-Fernandez, C.N. (2016), "Liturgy and glass ceiling in the process of strengthening the sustainability in institutions of higher education: a perspective from Ibero-America". In: Barth, M.M., Thomas, G., Rieckmann, I.M. (Eds.), *Routledge Handbook of Higher Education for Sustainable Development*, pp. 72 - 85. London.
- Grindsted, T.S. (2011), "Sustainable universities: from declarations on sustainability in higher education to national law", *Environmental Economics*, Vol. 2, pp. 29-36.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006), *Multivariate Data Analysis*, 6th ed.. ed.: Upper Saddle River, NJ.
- Hancock, L. and Nuttman, S. (2014), "Engaging higher education institutions in the challenge of sustainability: sustainable transport as a catalyst for action", *Journal of Cleaner Production*, Vol. 62, pp. 62-71.
- Hass, J. L., Brunvoll, F. and Hoie, H. (2002), Overview of Sustainable Development Indicators used by National and International Agencies. *OECD Statistics Working Papers*. doi: 10.1787/838562874641.
- Hopwood, B., Mellor, M. and O'Brien, G. (2005), "Sustainable Development: Mapping Different Perspectives", *Sustainable Development*, Vol. 13, pp. 38-52.
- Jabareen, Y. (2008), "A new conceptual framework for sustainable Development. Environment, development and sustainability", *Environment, development and sustainability*, 10 No 2, 179-192.
- Jongbloed, B., Enders, J. and Salerno, C. (2008), "Higher education and its communities: Interconnections, interdependencies and a research agenda", *Higher Education*, 56, 303–324.
- Katiliūtė, E., Daunorienė, A. and Katkutė, J. (2014), "Communicating the sustainability issues in higher education institutions World Wide Webs", *Procedia - Social and Behavioral Sciences*, Vol. 156, pp. 106 – 110.
- Lambrechts, W. and Liedekerke, L. V. (2014), "Using ecological footprint analysis in higher education: Campus operations, policy development and educational purposes", *Ecological Indicators*, Vol. 45, pp. 402–406,
- Larrán Jorge, M., Madueño, J. H., Calzado, Y., & Andrades, J. (2016), "A proposal for measuring sustainability in universities: a case study of Spain", *International Journal of Sustainability in Higher Education*, Vol. 17 no 5, pp. 671-697.
- Larrán Jorge, M.L., Madueno, J.H., Cejas, M.Y.C. and Peña, F. (2015), "An approach to the implementation of sustainability practices in Spanish universities", *Journal of Cleaner Production*, Vol. 106, pp. 34-44.
- Lauder, A., Sari, R.F., Suwartha, N. and Tjahjono, G. (2015), "Critical review of a global campus sustainability ranking: GreenMetric", *Journal of Cleaner Production*, Vol. 108, pp. 852-863.
- Leal Filho, W., Manolas, E. and Pace, P. (2015), "The future we want: Key issues on sustainable development in higher education after Rio and the UN decade of education for sustainable development", *International Journal of Sustainability in Higher Education*, Vol. 16, pp. 112 - 129.

- Law n.º 62/2007 10th September [Lei n.º 62/2007 de 10 de setembro]. Legal system of higher education institutions [Regime jurídico das instituições de ensino superior]. Diário da República, 1.ª série, N.º 174, pp. 6358–6389. Retrieved from http://www.crup.pt/images/documentos/legislacao/regime_juridico/Lei_n.62.2007_de_10_de_Setembro.pdf.
- Leon-Fernandez, Y. and Domínguez-Vilches, E. (2015), "Environmental management and sustainability in higher education: The case of Spanish Universities", *International Journal of Sustainability in Higher Education*, Vol. 16 No 4, pp. 440-455.
- Lozano, R. (2006), "Incorporation and institutionalization of SD into universities: breaking through barriers to change", *Journal of Cleaner Production*, Vol. 14, pp. 787 - 796.
- Lozano, R. (2008), "Envisioning sustainability three-dimensionally", *Journal of Cleaner Production*, 16, 1838–1846.
- Lozano, R. (2010), "Diffusion of sustainable development in universities curricula: an empirical example from Cardiff University", *Journal Clean Production*, Vol. 18, pp. 637-644.
- Lozano, R. (2011), "The state of sustainability reporting in universities", *International Journal of Sustainability in Higher Education*, Vol. 12, pp. 67-78.
- Lozano, R., Ceulemans, K., Alonso-Almeida, M., Huisingh, D., Lozano, F.J., Waas, T., Lambrechts, W., Lukman, R. and Hug, J. (2015), "A review of commitment and implementation of sustainable development in higher education: results from a worldwide survey", *Journal of Cleaner Production*, Vol. 108, pp. 1-18.
- Lozano, R., Lozano, F.J., Mulder, K., Huisingh, D. and Waas, T. (2013a), "Advancing Higher Education for Sustainable Development: international insights and critical reflections", *Journal of Cleaner Production*, Vol. 48, pp. 3-9.
- Lozano, R., Lukman, R., Lozano, F.J., Huisingh, D. and Lambrechts, W. (2013b), "Declarations for sustainability in higher education: becoming better leaders, through addressing the university system", *Journal of Cleaner Production*, Vol. 48, pp. 10 - 19.
- Lukman, R., Krajnc, D. and Glavic, P. (2010), "University ranking using research, educational and environmental indicators", *Journal of Cleaner Production*, Vol.18, pp. 619–628.
- Miller, K. (Ed.) (2014), *Cognitive Interviewing Methodology*, Hoboken: New Jersey: Wiley.
- Mohorko, A. and Hlebec, V. (2016), "Degree of cognitive interviewer involvement in questionnaire pretesting on trending survey modes", *Computers in Human Behavior*, Vol. 62, pp. 79-89.
- Moura, B.A. and Moura, L.B.A. (2013), "Ranqueamento de universidades: reflexões acerca da construção de reconhecimento institucional" [Ranking of universities: reflections on the construction of institutional recognition], *Acta Scientiarum Education*, Vol. 35, pp. 213-222.
- Pardellas Santiago, M. (2016), *Educación Ambiental, Movimiento en Transición e Sustentabilidade Universitaria. Estudio comparado de tres iniciativas pioneras: USC en Transición, Transition Edinburgh University e UMinho in Transition* (PhD Thesis), Universidade de Santiago de Compostela. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&site=eds-live&db=edstdx&AN=tdx.10803.383017>
- Popescu, M. and Beleau, C. (2014), "Improving management of sustainable development in universities", *Bulletin of the Transilvania University of Braşov*, Vol. 7, pp. 97-106.
- Ramos, T., and Pires, S. M. (2013), Sustainability Assessment: The Role of Indicators. In S. Caeiro, W. L. Filho, C. Jabbour & U. M. Azeiteiro (Eds.), *Sustainability Assessment Tools in Higher Education Institutions: Mapping Trends and Good Practices Around the World* (pp. 81-99). Cardiff, UK: Springer International Publishing.
- Sammalisto, K., Sundstrom, A. and Holm, T. (2015), "Implementation of sustainability in universities as perceived by faculty and staff e a model from a Swedish university", *Journal of Cleaner Production*, Vol. 106, pp. 45-54.
- Santos, M. J. N., Silva, J. L. A., Sampaio, J. J., Henriques, P. L., and Eusébio, C. (2005), *Desenvolvimento Sustentável e Responsabilidade Empresarial*. Oeiras: Celta Editora.
- Shi, H. and Lai, E. (2013), "An alternative university sustainability rating framework with a structured criteria tree", *Journal of Cleaner Production*, Vol.61, pp. 59-69.

- Shin, J. and Toutkoushian, R. (2011), The past, present, and future of university ranking. In R.T. In J. Shin, E U. Teichler (Eds) (ed.) *University ranking: theoretical basis, methodology and impacts on global higher education*. Springer: Dordrecht.
- Shriberg, M. (2002), "Institutional assessment tools for sustainability in higher education", *International Journal of Sustainability in Higher Education*, 3 no 3, 254-270.
- Singh, R.K., Murty, H. R. , Gupta, S.K. and Dikshit, A. K. (2012), "An overview of sustainability assessment methodologies", *Ecological Indicators*, Vol. 9, No 2, March 2009, pp. 189-212.
- Stough, T., Ceulemans, K., Lambrechts, W. and Cappuyns (2017), "Assessing sustainability in higher education curricula: A critical reflection on validity issues", *Journal of Cleaner Production*, pp. 1-11.
- Too, L. and Bajracharya, B. (2015), "Sustainable campus: engaging the community in sustainability", *International Journal of Sustainability in Higher Education*, Vol. 16, pp. 57-71.
- UNEP (1972), Declaration of the United Nations Conference on the Human Environment. United Nations Environment Programme.
- University of Minho (2016). *Sustainability Indicators*. Retrieved from <https://www.uminho.pt/EN/uminho/Sustainability/Pages/default.aspx> (31st December of 2016).
- Vagnoni, E. and Cavicchi, C. (2015), "An exploratory study of sustainable development at Italian universities", *International Journal of Sustainability in Higher Education*, Vol. 16 No. 2, pp. 217 – 236.
- Von Hauff, M. and Ngyyen, T. (2014), "Universities as Potential Actors for Sustainable Development", *Sustainability*, Vol.6, pp. 3043-3063.
- Waas, T., Hugé, J., Verbruggen, A. and Wright, T. (2011), "Sustainable Development: A Bird's Eye View", *Sustainability*, Vol. 3, pp. 1637-1661.
- Waas, T., Hugé, J., Verbruggen, A., and Wright, T. (2011), "Sustainable Development: A Bird's Eye View", *Sustainability*, 3, 1637-1661.
- White, M.A. (2013), "Sustainability: I know it when I see it", *Ecological Economics*, Vol. 86, pp. 213-217.