SUSTAINABILITY AND MANAGEMENT OF HIGHER EDUCATION INSTITUTIONS: SCIENTIFIC PRODUCTION ANALYSIS

Anne Vanessa Henchen[1]
Rosamaria Moura-Leite[2]
José Carlos Jesus Lopes[3]

ABSTRACT

Objective of the study: To analyze the evolution of scientific publications on socio-environmental management and sustainability in Higher Education Institutions (IES).

Methodology / approach: We used the ProKnow-C method to select the bibliographic portfolio and carry out the bibliometric analysis. The research period covered 2002 to early 2017.

Originality / Relevance: Due to the relevance that sustainability has been gaining in recent years, socio-environmental management emerges as a way for organizations to demonstrate, in their policies and practices, their commitment towards society and the environment. In this context, HEIs need to serve as an example because of their role as opinion makers. Given the above, the purpose of the study proves to be relevant.

Main results: A bibliographic portfolio with 40 articles was selected, where the Journal of Cleaner Production and the International Journal of Sustainability in Higher Education stood out. We observed a significant increase in the number of citations to the articles in our bibliographic portfolio in the last five years under analysis.

Theoretical / methodological contributions: The results of the study will help researchers chose a high-quality and scientifically relevant theoretical background.

Conclusion: As a recommendation for future works, we suggested the application of the next stage of the ProKnow-C method, called systemic analysis, to examine the content of the articles in the bibliographic portfolio evidenced in this research.

Keywords: Universities. Socio-environmental Management. Bibliometric Study.

[1] Graduanda do curso de Administração – Universidade Federal de Mato Grosso do Sul - UFMS. Campo Grande, MS – Brasil. ORCID: https://orcid.org/0000-0002-7152-4528. E-mail: anne_vanessa1@hotmail.com
[2] Doutora em Administração – Universidad de Salamanca – USAL. Salamanca - Espanha. ORCID: https://orcid.org/0000-0002-3481-6441 E-mail: rosamaria.leite@ufms.br
[3] Doutorado em Meio Ambiente e Desenvolvimento – Universidade Federal do Paraná - UFPR- Curitiba, PR – Brasil. ORCID: https://orcid.org/0000-0002-3012-8748. E-mail: jose.lopes@ufms.br

SUSTENTABILIDADE E GESTÃO DE INSTITUIÇÕES DE ENSINO SUPERIOR: ANÁLISE DA PRODUÇÃO CIENTÍFICA

RESUMO

Objetivo do estudo: É analisar a evolução das publicações científicas acerca do tema gestão socioambiental e sustentabilidade, na prática das Instituições de Ensino Superior (IES).

Metodologia/abordagem: Utilizou-se o método *ProKnow-C* para seleção do portfólio bibliográfico e análise bibliométrica. O período de investigação foi de 2002 a início de 2017.

Originalidade/Relevância: Em virtude da importância que a temática da sustentabilidade vem alcançando nos últimos anos, a gestão socioambiental surge como um caminho para as organizações demonstrarem, em suas políticas e práticas, o compromisso perante a sociedade e o meio ambiente. Nesse contexto, as IES precisam servir de exemplo devido ao seu papel como formadoras de opinião. Em face do exposto, o objetivo do estudo demostra relevância.

Principais resultados: Foi selecionado um portfólio bibliográfico de 40 artigos, onde os periódicos *Journal of Cleaner Production* e *International Journal of Sustainability in Higher Education* receberam destaque. Observou-se um incremento significativo no número de citações dos artigos do portfólio bibliográfico nos últimos cinco anos analisados.

Contribuições teóricas/metodológicas: Os resultados do estudo auxiliam o pesquisador na escolha de referencial teórico de qualidade e reconhecido cientificamente.

Conclusão: Como recomendação para trabalhos futuros, sugere-se aplicar a próxima fase do método *ProKnow-C*, denominada análise sistêmica, examinando o conteúdo dos artigos do portfólio bibliográfico evidenciados nesta pesquisa.

Palavras-chave: Universidades. Gestão Socioambiental. Estudo Bibliométrico.

SOSTENIBILIDAD Y GESTIÓN DE INSTITUCIONES DE EDUCACIÓN SUPERIOR: ANÁLISIS DE LA PRODUCCIÓN CIENTÍFICA

RESUMEN

Objetivo del estudio: Es analizar la evolución de las publicaciones científicas acerca de la gestión socioambiental y sostentabilidad, en la práctica de las Instituciones de Educación Superior (IES).

Metodología / Enfoque: Se utilizó el método ProKnow-C para la selección del portafolio bibliográfico y el análisis bibliométrico. El período de investigación fue de 2002 a principios de 2017.

Originalidad / Relevancia: En virtud de la importancia que la temática de la sostenibilidad viene alcanzando en los últimos años, la gestión socioambiental surge como un camino para que las organizaciones demuestren, en sus políticas y prácticas, el compromiso ante la sociedad

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

39

y el medio ambiente. En este contexto, las IES deben servir de ejemplo debido a su papel como formadoras de opinión. En vista de lo expuesto, el objetivo del estudio demuestra relevancia.

Principales resultados: Se seleccionó un portafolio bibliográfico de 40 artículos, donde los periódicos *Journal of Cleaner Production* y *International Journal of Sustainability in Higher Education* recibieron destaque. Se observó un incremento significativo en el número de citas de los artículos del portafolio bibliográfico en los últimos cinco años analizados.

Contribuciones teóricas / metodológicas: Los resultados del estudio auxilian al investigador en la elección de referencial teórico de calidad, reconocido científicamente.

Conclusión: Como recomendación para trabajos futuros, se sugiere aplicar la próxima fase del método ProKnow-C, denominada análisis sistémico, examinando el contenido de los artículos del portafolio bibliográfica evidenciados en esta investigación.

Palabras-clave: Universidades. Gestión Socioambiental. Estudio Bibliométrico.

1 Introduction

In this century, sustainability issues are placed at the center of reflections on the proportions and impacts of economic development (Jacobi, 2003), since the demand for social well-being – both present and future -, coupled with the preservation of the environment has gained momentum. In this sense, organizations must evaluate not only their processes, strategies and goals, but also their engagement in the community and how their operations affect nature and the communities to which they belong (Shriberg, 2002b).

Educational sectors, such as HEIs, play a prominent role in the creation of a sustainable and fair society, due to their responsibility for training tomorrow's decision makers. Thus, in addition to teaching socio-environmental awareness, these organizations need to incorporate such principles and practices into all levels of the entity, including them in their regular operations and activities, in order to serve as an example to the local population and society as a whole (Tauchen & Brandli , 2006).

Because of the relevance of the subject, a bibliometric mapping proves to be a valid tool for researchers, as it allows reusing researches in different scales and contexts and developing studies that may fill gaps in the literature, other than suggesting research subjects, problems, hypotheses and innovative methodologies.

From this point of view, the article by Chaves, Freitas, Ensslin, Pftscher, Petri and Ensslin (2013) provides a broad contribution to the Academy, as it selected a remarkable and scientifically relevant theoretical portfolio on the subject of social and environmental management and sustainability within Higher Education Institutions, hereinafter referred to as HEI, covering the period 2002 to mid-2012. Among the selected papers, they selected the most renowned authors and vehicles.

However, Rubbo, Pilatti, Telles, Bittencourt and Francisco (2016) and Ceulemans, Molderez and Van Liedekerke (2015) observed that from 2012 to 2014, there was a significant increase in the number of scientific publications on organizational sustainability and on the demonstration of sustainability practices by HEIs, respectively, which shows a continuous interest in such subject matter.

In addition, a number of significant events took place in 2015 and 2016, reinforcing the relevance of such discussion at a global level, such as the UN's new Sustainable Development Agenda and its 17 global goals to be achieved by 2030, and the first legally binding global climate agreement, setting mandatory goals for signatory countries, celebrated during the COP-21, in Paris (Portal Brasil, 2015a and b, Federal Senate, 2015). Still, it is worth noting the global

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

40

awareness of climate change spread during the opening ceremony of the Olympic Games in Brazil.

In this context, the research question that guides this work arises: "How did the knowledge on socio-environmental management and sustainability issues evolved in Higher Education Institutions?" To answer the question, we intend to continue the article written by Chaves et al. (2013), adding the period 2012 to early 2017, with the purpose of observing the evolution of the subject matter in the Academy.

In view of the above, the objective of this paper is to analyze the evolution of scientific publications about the subject of social and environmental management and sustainability in HEIs. To that end, the following specific objectives were defined: (i) to select a scientifically relevant bibliographic portfolio on the subject of social and environmental management and sustainability in HEIs; (ii) to point the most relevant authors, journals, articles and keywords; (iii) to compare our results with those found by Chaves et al. (2013).

In order to accomplish such task, we chose the Knowledge Development Process - Constructivist (ProKnow-C) method as the instrument, and the chosen time cut was the 2002 - early 2017 period. The survey of articles to make up the Bibliographic Portfolio was made in the SCOPUS international scientific database, in which we filtered only publications from nine selected journals. Afterwards, we used graphic resources to analyze the main characteristics regarding authors, journals in which they were published and keywords.

In addition to this introductory section, this article brings the theoretical background on social and environmental management and its relationship with higher education institutions in section 2; it presents the methodological framework and data collection procedures in section 3; it evidences and discusses the results in section 4; and finally, it brings the final considerations in section 5.

2 Theoretical Background

2.1 Socio-environmental Management

Socio-environmental responsibility has been widely discussed worldwide, aiming at conceiving a concept of Sustainable Development for the whole community. The expression symbolizes the engagement of an individual or corporation towards society and the environment, in such a way that their actions seek to cause a positive impact (Luiz, Rau, Freitas & Pfitscher, 2013). Social and environmental management, therefore, consists in enforcing this responsibility in the context of organizational policies and practices. While managing an institution, actions aimed at economic growth should be in line with social and environmental concerns, thus emphasizing the sustainability of the business.

As Nascimento, Lemos and Mello (2008) point out, this new management style is related to the ethical and core values of community life, such as human rights and protection of the environment. While the organization promotes economic development, it cooperates for improving the quality of life of the surrounding community and society as a whole.

The social issue concerns corporate citizenship, which includes respect for employees and their families, good relationships with stakeholders and representative associations, job creation and maintenance, financial performance of the entity and investment in community activities (Nascimento *et al.*, 2008; Khoury, Rostami, & Turnbull, 1999). As for the environmental issue, it deals with the protection and preservation of the environment through the rational use of natural resources, reduction of consumption, proper waste disposal, waste

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

41

reduction (water, energy), pollution control and the adoption of sustainable criteria in the choice of suppliers (Luiz et al., 2013).

In this context, it should be emphasized that government agencies linked to the Public Administration began to make a joint commitment towards social and environmental management, not only as regulators and inspectors, but as active and participating stakeholders (Chaves et al., 2013).

According to Engelman, Guisso and Fracasso (2009), the first step in the development of a socio-environmental management is to assess the organization's interaction with the environment, through an inventory of events and operating conditions, including an analysis of the applicable legislation.

In this regard, Maimon (1999) notes, however, that the efficiency of the deployment system is only ensured if all the hierarchical levels of the entity agree on the relevance of such system, as well as on the integration and commitment of each stakeholder.

More than a way of complying with legal requirements coming from the public power, such management method can be strategic for the organization, as it helps generate value and competitive advantage, at a time in which consumers are more and more conscious of the use of natural resources (Moura-Leite & Padgett, 2014). In this sense, in addition to improving the image of organizations that produce goods and services, both public and private, they may reap economic benefits from it, since the rationalization of resources results in cost reductions (Luiz et al., 2013, Hart & Milstein, 2004).

2.2 Higher Education Institutions and Socio-Environmental Management

The current globalized scenario and the constant political, economic and social changes to which the organizations are exposed demand professionals with different skills and competences. Such skills may be: (i) cognitive, like the ability to understand, solve problems, creativity, critical judgment, general knowledge, (ii) technical, like computer science, foreign languages, handling of specific equipment and work processes and (iii) behavioral, such as cooperation, initiative, responsibility, discipline, ethics and motivation (Gondim, 2002).

By promoting the transition between the school and the productive world, professional training becomes responsible for the education, training, development and motivation of young people and adults, so they can face such a reality (Gondim, 2002).

Lozano, Lukman, Lozano, Huisingh and Lambrechts (2013) understand that the mission of universities is to work for society and, to that end, they must make their best efforts to protect society from threats such as environmental degradation. The 1972 Stockholm Conference is cited by the authors as the first of its kind to formally recognize the importance of promoting the protection and conservation of the environment in education.

The authors also point out that many declarations, letters and academic partnerships were designed to promote Sustainable Development in the academic syllabuses and to provide guidance on how to implement sustainable processes in the institutions' systems, such as the Declarations of Talloires (1990), Halifax (1991), Swansea (1993), Kyoto (1993), Global Higher Education for Sustainability Partnership (2000) and Abuja (2009).

The implementation of socio-environmental management in the educational sector, more precisely in HEIs, is of utmost importance due to its historical role in producing and disseminating scientific knowledge and in the "civic, political, cultural and social education of its graduates" (Freitas, 2013, p.21). Due to its representativeness, while it reaps the benefits of this management model, the university also paves the way towards sustainability awareness and disseminates good socio-environmental practices for the community.

In charge of fostering and building critical thinking of tomorrow's citizens and decision-makers, HEIs, in addition to including in their syllabuses academic activities and

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

42

research/extension projects that promote social and environmental education, must put into practice what they teach. Thus, its internal management becomes a sustainable reference and functional example of success to the local population and society (Luiz, Alberton, Da Rosa & Pfitscher, 2014; Frizzo et al., 2014; De Resende Lara, 2012; Otero, 2010).

According to Matos, Cabo, Ribeiro & Fernandes (2015), several activities are necessary to develop sustainability in university management and to ensure actual improvements, not only internal but also external. They include awareness-raising campaigns, offer of a relevant bibliography collection and socio-environmental training courses, energy eco-efficiency, responsible consumption of water and resources, promotion of more sustainable means of transport for teachers and students, financial transparency and waste treatment.

Therefore, it is understood that a Sustainable Faculty or University is one that strives to aggregate, into the main teaching activities, issues related to sustainability in many fields, such as research, extension directed to national and international communities and to their own operations (Shriberg, 2002a). For that to occur, all the stakeholders must be educated and sensitized on the commitment towards a society that values human beings, as well as their wealth, without overlooking the finite resources of the planet.

Christensen, Thrane, Herreborg Jørgensen and Lehmann (2009) questioned in their work on the University of Aalborg, Denmark, how one could teach sustainability without practicing it. They found that, although the institution at issue was one of the first in the country to adopt an environmental policy, it appeared, at the time of the research, that such policy had never actually been implemented. The reasons for that included the senior management's lack of commitment, lack of vision of the technical staff and a limited understanding of the university's environmental impacts.

A successful case of implementing a Sustainability Management System (SGS) was found by Velazquez, Munguia and Ojeda (2013) at the University of Sonora, Mexico, where the tool proved to be effective in detecting and reducing water waste. In addition to the environmental benefits, since avoiding the causes of waste leads to a consequent reduction in pollution and water waste, the institution also reaped economic benefits.

In Brazil, Berchin, Grando, Marcon, Corseuil and Guerra (2017) analyzed the sustainable management at the Federal Institute of Santa Catarina (IFSC) and identified the need to improve performance indicators adopted and to develop a network that allows the exchange of information between the federal HEIs.

3 Methodology

3.1 *ProKnow-C*: Instrument of Intervention

Lima & Mioto (2007) explain that a bibliographic research, in the context of knowledge production, implies the delineation of an ordered set of criteria and methodological procedures in the search for solutions to the proposed study subject and, therefore, cannot be random.

Thus, the instrument of intervention chosen for this study is the Knowledge Development Process - Contrutivist (ProKnow-C), which proved to be a remarkable bibliographical revision tool as, according to a constructivist approach, it builds knowledge based on the interests and delimitations set by the researcher (Bortoluzzi, Ensslin, Ensslin & Valmorbida, 2011).

Developed since 2005 by the Laboratory of Multi-criteria Decision Support Methodology - Constructivist (LabMCDA-C), this instrument is based on the Multi-criteria Decision Support - Constructivist methodology (MCDA-C), both in theoretical and practical terms (Ensslin, Ensslin, Imlau & Chaves, 2014).

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

43

The scientists from LabMCDA-C observed the lack of a structured process for the selection and analysis of scientific literature and sought to produce one whose purpose was to carry out searches which range and focus would be ascertained by the researchers of the subject. The first versions came up in 2007 and 2008, followed by the first publications in 2009. Scientific recognition was conceived by the first international publication as a result of these investigations, in Tasca et al. (2010), encouraging dozens of subsequent publications (Ensslin et al., 2014).

In order to meet registration and originality requirements, by the end of 2010, the founders named the tool as *ProKnow-C - Knowledge Development Process-Contrutivist*, and in 2012 it eventually became consolidated as a method that would guide the construction of knowledge for researchers, according to their motivations, delimitations and perceptions regarding the study subject (Ensslin et al., 2014).

The process is structured in four stages: (i) selection of the Bibliographic Portfolio (BP) with articles on the research subject; (ii) bibliometric analysis of the BP; (iii) systemic analysis of the BP; and (iv) definition of a research question and study subject (s) for future researches (Valmorbida, Ensslin, Ensslin & Ripoll-Feliu, 2014; Tasca, Ensslin, Ensslin & Alves, 2010).

The first step, which is the selection of relevant scientific papers that will compose the portfolio, is divided into two stages: (a) selection of an unrefined article database; and (b) filtering of the article database. It should be emphasized that these articles are checked for their scientificity according to their source, as they need to be collected on scientific databases and the relevance is ascertained by the number of citations to each article. The researchers' subjectivity becomes evident in these sub-stages, since it is necessary to make choices to make the process move forward (Ensslin et al., 2014; Valmorbida et al., 2014; Bortoluzzi et al., 2011).

In order to select the unrefined article database, researchers need to define the research axes and their respective keywords, which will identify the primary focus of the study. Next, the databases are established to thus perform the search of articles with all possible combinations of keywords from each axis. In order to verify if the chosen keywords are in line with the research subject, the methodology suggests the reading of two articles among those found in the search to check if there are any other expression that could represent it better. With that in mind, it is necessary to repeat the process, incorporating such expressions in the search for scientific articles (Afonso, Souza, Ensslin & Ensslin, 2011).

The filtering of the article database consists initially in eliminating duplicates (redundancy), followed by the alignment of the title to the proposed subject. The articles that remained after the filtering must be checked for their scientific relevance, where researchers will look for the number of citations to each of the articles. After proving their scientific relevance, through the calculation of the representativeness of each article before the entire database in terms of the number of citations, the abstracts are read to check if they really are in line with the subject and should remain in the article database (Afonso et al. al., 2011; Bortoluzzi et al., 2011).

For the group of articles which scientific relevance could not yet be confirmed, the first procedure is to check the year of publication, since a recent article, that dates back to no longer than two years, has not yet had time for due recognition. Once such condition is confirmed, the abstract must be read to observe the alignment with the research. If it is an older article, it should first be determined if any of the authors is part of the article database with confirmed scientific relevance, and if so, it is also necessary to read the abstract to decide whether to keep or to discard it (Afonso et al., 2011).

Finally, to build the Bibliographic Portfolio of the study, the researcher must: (a) gather the two groups mentioned above and check the availability of the full article for consultation - if not available, they are then discarded; (b) read thoroughly the remaining articles in order to confirm the suitability with the research subject.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

44

The second stage of ProKnow-C aims to identify the characteristics of the BP by means of a bibliometric analysis. Such mapping is described as the exercise of counting the occurrence of a certain variable in the publications of the portfolio, with the purpose of informing the researchers where they can seek more information about the subject, thus building the prior knowledge. Next, the researchers must ascertain the degree of relevance of the journals, the degree of scientific recognition of the articles, the degree of relevance of the authors and the most frequent keywords (Ensslin et al., 2014; Vaz, Ionamata & Stiirmer, 2014).

The systemic analysis, which is the third stage of the process, consists of a critical and reflexive activity, in which the researcher defines an approach and looks into the point of view of the articles in order to identify gaps and research opportunities on the subject (Vaz et al., 2014; Valmorbida, Ensslin, Ensslin & Bortoluzzi, 2011).

After developing these three stages, the researcher has acquired enough knowledge to define the fragment of literature that will help explore and intervene scientifically. Consequently, in the fourth and last stage, the researcher is now able to propose the question and objective(s) that will guide the research work (Valmorbida et al., 2014).

ProKnow-C has already been used in several literature review and analysis works in a variety of approaches, many of them involving the Performance Evaluation perspective.

Studies by Rosa, Ensslin and Ensslin (2009), Afonso et al. (2011), Bortoluzzi et al. (2011) and Ensslin et al. (2014) sought to build some of the knowledge on the subject by developing the first two stages of the process: 1) selection of a scientifically relevant bibliographic portfolio; and 2) mapping of its characteristics. Performance evaluation was addressed in the contexts of environmental disclosure, sustainability, networks of small and medium enterprises and agricultural cooperatives, respectively. As a suggestion for future research in these areas, the authors recommend applying the next stage of the methodology, namely, the systemic analysis of the content of the BP.

The work of Valmorbida et al. (2014) chose to use the procedure more thoroughly, skipping only the bibliometric analysis of the scientific publication portfolio. The aim was to identify research opportunities related to the Management of Public Universities, from the perspective of performance evaluation.

Other scenarios are also observed in the handling or application of the ProKnow-C method, such as in Valmorbida et al. (2011), who investigated the subject "Result-Oriented Public Management", in which he executed the steps of selecting the Bibliographic Portfolio with the greatest scientific recognition and its subsequent systemic analysis. Vaz et al. (2014), on the other hand, deemed relevant to use the bibliometric analysis of the portfolio, in addition to the systemic analysis, to discuss "Solid Waste Management in Higher Education Institutions".

3.2 Data collection procedure

In order to complete the first selection stage of the Bibliographic Portfolio, which consists of building an unrefined article database, the first idea was to adopt the same research axes and their respective keywords and the same databases defined by Chaves et al. (2013) in their study, in order to have a reliable comparison. However, when we performed the search of the 24 keyword combinations in the first database (ISIKNOWLEDGE), it has already brought much more articles than the database found by Chaves et al. (2013), combining the three databases.

In this sense, we chose to use only the SCOPUS database, since it indexes more than 20,000 journals (more than the other databases) and is updated on a daily basis. Also, in order to further narrow the unrefined articles database, since the outlined collection, between 2002

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

45

and 2017, resulted in about 40,000 articles, it was decided to filter only the journals, as they are currently more relevant to the subject matter.

Thus, using the study by Ceulemans et al. (2015) and the Bibliographic Portfolio of Chaves et al. (2013) as a reference, the investigation was limited to articles published in the *International Journal of Sustainability in Higher Education*, *Journal of Cleaner Production*, *Journal of Management & Organization, Sustainability Science, Higher Education Policy, Journal of Business Ethics, Ecological Indicators, Resources, Conservation and Recycling and Waste Management,* published from 2002 until March 1, 2017. The *Journal of Modern Accounting & Auditing* quoted by Chaves et al. (2013) is not indexed by SCOPUS, so it was not included in the survey. It should be noted that the search fields were: title, abstract and keywords of the article. By grouping the results of the 24 combinations of keywords, it amounted to 1,134 articles.

Following the application of the method, the keyword suitability test was carried out, which objective is to verify the need to include new keywords into the research axes. To that end, we chose two articles which titles and abstracts were in line with the subject matter - Viebahn (2002); James and Card (2012) - and we then read their keywords. By pairing them with the keywords chosen by Chaves et al. (2013), it was found that there was no need to repeat the process. Thus, we proceeded to the next stage.

To filter the article database, we initially imported it to Excel and manually deleted the repeated articles, which left us with 330 articles in the database. Then, the titles of the articles were read with the purpose of examining their suitability with the research subject. Articles which titles were misaligned or that addressed education for sustainability at HEIs were discarded, as is the case of Moore's "*Seven recommendations for creating sustainability education at the university level: a guide for change agents",* present in the Bibliographic Portfolio of Chaves et al. (2013). A database of 109 non-repeated articles with aligned titles was then achieved.

After filtering by titles, the articles were selected for scientific acknowledgment and reading of the abstracts. This scientific acknowledgment was surveyed at Google Scholar, by searching the citations to each of the articles in other papers. It should be noted that the survey was carried out on March 26, 2017. By calculating the proportion of each article in number of total citations, we ascertained the relevance of 40 articles (cut-off point of 75% of representativity) .

The other 69 articles were then analyzed again, to check if the article was recent (published after 2015), since there would not be enough time for a proven scientific acknowledgment, which led us to add other 22 articles. We also added other 11 studies to the recent articles, although they were published in the years prior to 2015, because they were written by at least one of the authors found in the database of scientifically acknowledged articles. This stage resulted therefore in 33 articles, which were added to the first 40.

After reading the abstracts of the 40 scientifically acknowledged articles of the database, we excluded 10 articles, because they were not fully aligned with the research subject. Likewise, by reading the articles that were further analyzed, it was observed that 24 of them could move on to the next stage.

The consolidation of the remaining 54 articles generated a single database that would be submitted to the ultimate analysis: availability of the full-text article and thorough reading. We found that they were all available for free-of-charge viewing and after reading thoroughly the 54 articles, we concluded that 14 of them were not fully aligned with the subject matter. Therefore, the Bibliographic Portfolio consisted of 40 articles that addressed specifically management and sustainability within HEIs. The list of the 40 articles of the portfolio can be found in Annex I.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

46

4 Bibliometric Analysis

Following the selection of the Bibliographic Portfolio comes the bibliometric analysis, which, in this study, covers journals, articles, authors and keywords of greater prominence among those included in the portfolio and those quoted by it.
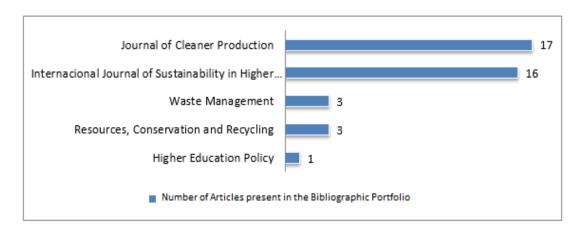
4.1 Prominent Journals

4.1.1 Most prominent journals in the Bibliographic Portfolio

Just as in Chaves et al. (2013), the most prominent journals were *the Journal of Cleaner Production* and the *International Journal of Sustainability in Higher Education*. These journals accounted for 33 of the 40 selected articles (more than 80% of the total), 17 of which published by the *Journal of Cleaner Production* and 16 by *the International Journal of Sustainability in Higher Education*. The minor difference - more specifically of one article - between them confirms what Chaves et al. (2013) observed in their analysis, where the number of articles represented by each of these journals in the portfolio was equal (five articles each from a total of 14 selected articles).

Thus, the *Journal of Cleaner Production* - ISSN 0959-6526 - and the *International Journal of Sustainability in Higher Education* - ISSN 1467-6370 - can be validated as the most expressive journals for the subject matter at issue, emphasizing that both journals are exclusively dedicated to scientific dissemination on sustainability. The *International Journal of Sustainability in Higher Education* stands out also because it was the first journal to address the sustainable issue for HEIs, as its name suggests (Chaves et al., 2013).

It should be noted that out of the nine journals initially searched in the database, only five remained in the Bibliographic Portfolio, the same ones pointed out in the portfolio chosen by Chaves et al. (2013).

Image 1: Most Prominent journals in the Bibliographic Portfolio
Source: Research results.

4.1.2 Most Prominent Journals of the Bibliographic Portfolio

As for the journals that published the articles mentioned in the portfolio's references, as pointed by Chaves et al. (2013), the *International Journal of Sustainability in Higher Education* and the *Journal of Cleaner Production* stood out, with a great lead over the others, which strengthened their position as the most expressive journals for the research subject at issue.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

47

There is still a slight superiority of the *International Journal of Sustainability in Higher Education* (159 citations) over the *Journal of Cleaner Production* (133 citations) in the amount of 26 articles, unlike what occurred with the Bibliographic Portfolio, where the latter ranked first.
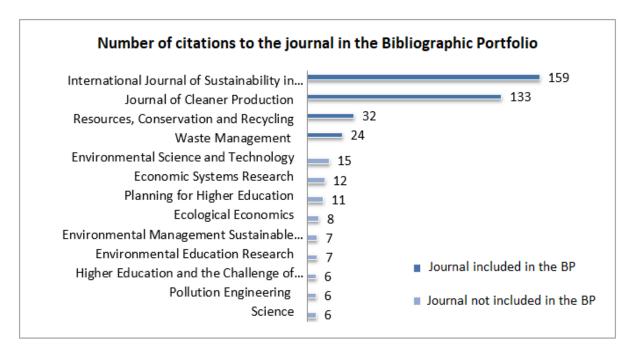
The next best placed, as can be seen in the graph, are the journals *Resources, Conservation and Recycling* and *Waste Management*, as found by Chaves et al. (2013). In this new analysis, they appeared in the citations 32 and 24 times, respectively. The *Higher Education Policy*, which in 2012 ranked fifth with four citations, kept the same quantity and was not included in the graph due to the low representativeness.

The titles of the journals below are not part of the Bibliographic Portfolio of this work; however, most of them make a clear reference to the sustainability issue and/or Higher Education issues. The highlight goes to *Environmental Science and Technology* and *Economic Systems Research* with 15 and 12 citations, respectively. Neither of them appeared in the list of references of Chaves et al. (2013).

Environmental Science and Technology is a scientific journal published since 1967 by the American Chemical Society. It covers researches on major advances, trends and challenges in science, technology and environmental policy, aiming to promote an interdisciplinary understanding of the environmental field (ACS Publications, 2017).

The *Economic Systems Research,* in turn, is the official scientific journal of the International Input-Output Association (IIOA), published by Taylor & Francis Journals, and is dedicated to deepening theoretical and practical knowledge about economic systems and processes and their changes over time and space. Its subjects include multisector models of structural change and development, ecosystems, and the treatment of degradable resources, as well as environmental and strategic issues (Taylor & Francis Online, 2017).

The other journals are not included in the graph because their articles were mentioned only one to five times in the total of references.

Image 2: Most Prominent Journals in the references of the Bibliographic Portfolio
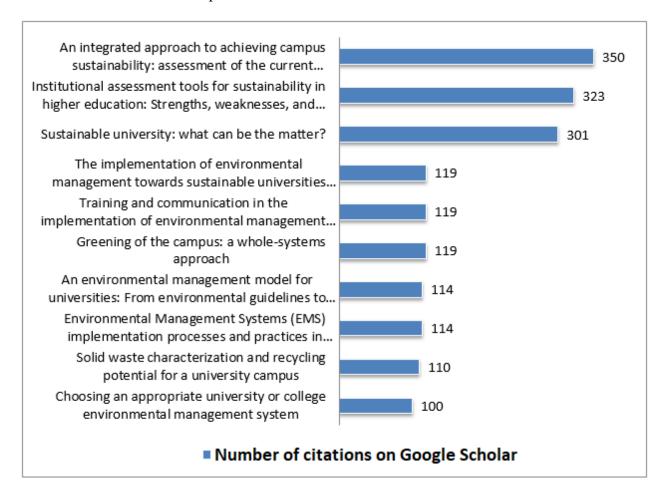Source: Research results.

4.2 Most Prominent Articles

4.2.1 Most Prominent Articles in the Bibliographic Portfolio

Differently from the study by Chaves et al. (2013), where the most prominent article featured in Google Scholar was Shriberg's (2002a) *"Institutional assessment tools for sustainability in higher education: strengths, weaknesses, and implications for practice and theory"*, with 82 citations, in our survey the same articles ranked second, showing an evolution of 241 citations in the period under analysis.

The graph in Image 3 shows that the work of Alshuwaikhat and Abubakar (2008), named "*An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices"*, achieved remarkable scientific acknowledgement during the six years analyzed in our survey, surpassing the others and taking the first position in the ranking, with 350 citations.

This article stood out when compared to the frequency of occurrences in the references of the articles of the portfolio (9 times) and when compared to what had been pointed out by Chaves et al. (2013), in terms of joint citations. The article by Velazquez, Munguia, Platt & Taddei, named *"Sustainable university: what can be the matter?"* (2006) reached the third place in the ranking of the most prominent articles in the Bibliographic Portfolio and appeared 6 times in the references of the same portfolio.

Image 3: Most prominent articles in the Bibliographic Portfolio
Source: Research results, collected on May 20, 2017.

4.2.2 Most prominent articles in the references of the Bibliographic Portfolio

As it can be seen in graph (Image 4), the article "*Toward a new conception of the environment-competitiveness relationship*", which appeared in the first place in the work of Chaves et al. (2013), lost prominence to *"The theory of planned behavior"* and *"Resilience and stability of ecological systems",* even though it gained further scientific acknowledgement, with a total amount of 3,474 citations on Google Scholar.

"The Theory of Planned Behavior" written by I. Ajzen was published in 1991 by the journal "*Organizational Behavior and Human Decision Processes"* and addresses the aspects of planned human behavior theory, taking into account their attitudes, subjective norms and control. As it has been published a long time ago and it addresses aspects of human nature, which are relevant to most scientific fields and not only to Psychology, we can explain the perceptible prominence of this article over the others, with 49,142 citations.

The works highlighted in Image 4 are part of the list of most prominent articles in the portfolio references of Chaves et al. (2013). As in their research, we did not find in the current research the articles of the references, which could become part of the Bibliographic Portfolio due to the fact that most of them deal with issues such as sustainability and management, but not specifically with socio-environmental management in HEIs.

The exception, demonstrated by Chaves et al. (2013), was "*Green campuses: the road from little victories to systemic transformation",* which could be applied to the ProKnow-C filters. In this survey, although the number of citations have increased from 90 to 253, it did not appear in the graph, as it was placed 85th in the ranking.

As it can be inferred, none of the most prominent articles in the references, as show in the graph of Image 4, belong also to the Bibliographic Portfolio.
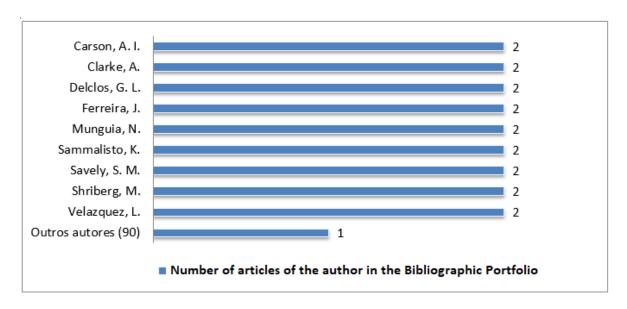
Image 4: Most prominent articles in the references of the Bibliographic Portfolio
Source: Research results, collected on May 20, 2017.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

51

4.3 Most prominent authors

4.3.1 Most prominent authors in the Bibliographic Portfolio

As for the authors that make up the portfolio, Carson, Clarke, Delclos, Ferreira, Munguia, Sammalisto, Savely, Shriberg and Velazquez, were equally highlighted and appeared twice in each of them. It should be noted that the only author that had stood out in the study by Chaves et al. (2013) was Shribergm, with two papers.

Image 5: Most prominent authors in the Bibliographic Portfolio
Source: Research results.

4.3.2 Most prominent authors in the references of the Bibliographic Portfolio

In reviewing the results, one notices that the authors Velazquez and Munguia, who ranked first in Chaves et al. (2013) portfolio references, lost prominence to Lenzen and Lozano. The latter outweighed the others as their papers gained scientific acknowledgment, cited 27 and 20 times, respectively.

It is important to note that, in Chaves et al. (2013), Lenzen does not appear in the list and Lozano had only 4 citations, sharing the 3rd position with other authors. Velazquez and Munguia had 7 citations each and, according to the current research, they were cited 5 more times, changing the scenario to 12 citations each. Wright, in turn, who had previously ranked 3rd, remains in the same position, with 8 more citations.

Carson, Clarke, Delclos, Ferreira, Sammalisto, Savely and Shriberg, who - in addition to Velazquez and Munguia - were featured in the Bibliographic Portfolio, all appear in the reference list of the same portfolio (only Ferreira is not featured in Image 6, as he is one of the 15 authors who were cited 4 times).

Besides, the presence of 9 other authors out of the 38 listed authors in the Bibliographic Portfolio, as shown in Image 6, validates the suitability of the researchers' choice in the selection of the articles.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

52

Image: Most prominent authors in the references of the Bibliographic Portfolio
Source: Research results.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019
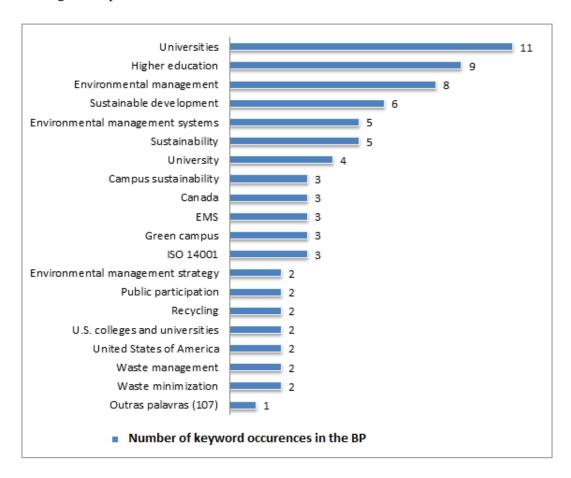
53

4.4 Most prominent keywords

Regarding the integration of keywords of the articles in the portfolio, we observed a suitability with the research subject, in other words, they allude to Socio-environmental Management, Sustainable Development and HEIs. The exceptions are only the words *Canada* and *United States of America*, which portray the study sites of each paper.

The keyword Higher education, first place in Chaves et al. (2013) with 6 occurrences, loses visibility to Universities. The latter went from 3 to 11 citations in the current research; while the second place evolved from 3 to 9 occurrences.

Environmental management, which in Chaves et al. (2013) ranked 2nd along with *Sustainable development* and *Sustainability*, both with 4 occurrences, outweighed them with 4 more citations, reaching the 3rd place

Image 7: Most prominent keywords
Source: Research results.

5 Final considerations

Considering the relevance that the sustainability issue thematic has been achieving, especially from 2012 onwards, the objective of this research was to analyze the evolution of scientific publications about socio-environmental management and sustainability in HEIs, in order to continue the work proposed by Chaves et al. (2013).

Extending the investigation period to early 2017, since Chaves et al. (2013) considered the 2002 – 2012 period, the present article used the same procedure that was proposed in such paper, known as ProKnow-C, which aims to assist the researcher in the choice of a high-quality and scientifically acknowledged theoretical background.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

54

Thus, after applying the method, we selected a bibliographic portfolio with 40 articles and checked their characteristics through a bibliometric analysis. As a result, the most outstanding journals in the composition of the portfolio were the *Journal of Cleaner Production* and the *International Journal of Sustainability in Higher Education*, which published 17 and 16 articles of the portfolio, respectively. In the references of the same portfolio, the *International Journal of Sustainability in Higher Education* stands out with 159 citations, while the *Journal of Cleaner Production* is cited 133 times.

As for the most scientifically acknowledged articles, the highlight was "*An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices*", by Alshuwaikhat and Abubakar (2008), with 350 citations in Google Scholar. In contrast with the frequency of appearances in the references of the portfolio, this article also stood out over the others, with 9 occurrences.

The authors with more papers in the Bibliographic Portfolio are Carson, Clarke, Delclos, Ferreira, Munguia, Sammalisto, Savely, Shriberg and Velazquez, each one appearing twice. This indication shows that the subject has gained prominence, reason for which no author stood out alone. Nevertheless, in this portfolio's references, Lenzen (who even belongs to the portfolio) and Lozano gained prominence with their researches and were cited 27 and 20 times, respectively.

Finally, the most widely used keyword in the articles of the Bibliographic Portfolio is "*Universities*", followed by *"Higher education"* and *"Environmental management"*, which were also used by the authors of this work.

With that in mind, although the bibliographic search of this research is limited to the journals *International Journal of Sustainability in Higher Education, Journal of Cleaner Production, Journal of Management & Organization, Sustainability Science, Higher Education Policy, Journal of Business Ethics, Ecological Indicators , Resources, Conservation and Recycling* and Waste Management in the SCOPUS database alone, it is important to recognize the conceptual suitability of the selected portfolio.

As a recommendation for future works, we suggest the application of the next phase of the ProKnow-C method, called systemic analysis, which will look into the contents of the articles of the Bibliographic Portfolio pointed out by this survey.

6 Acknowledgements

References

ACS Publications. (2017). *Environmental Science and Technology.* Recuperado em 04 maio 2017, de http://pubs.acs.org/journal/esthag

Afonso, M. H. F., Souza, J. V., Ensslin, S. R. & Ensslin, L. (2011). Como construir conhecimento sobre o tema de pesquisa? Aplicação do processo Proknow-C na busca de literatura sobre avaliação do desenvolvimento sustentável. *Revista de Gestão Social e Ambiental, 5*(2), 47-62.

Berchin, I. I., Grando, V. S., Marcon, G. A., Corseuil, L. & Guerra, J. B. S. O. A. (2017). Strategies to promote sustainability in higher education institutions: case study of a federal institute of higher education of Brasil. *International Journal of Sustainability in Higher Education,* 18(7), 1018-1038.

Bortoluzzi, S. C., Ensslin, S. R., Ensslin, L. & Valmorbida, S. M. I. (2011). A Avaliação de desempenho em redes de pequenas e médias empresas: estado da arte para as delimitações postas pelo pesquisador. *Revista Eletrônica de Estratégia & Negócios, 4*(2), 202-222.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

55

Ceulemans, K., Molderez, I. & Van Liedekerke, L. (2015). Sustainability reporting in higher education: a comprehensive review of the recent literature and paths for further research. *Journal of Cleaner Production, 106*, 127-143.

Chaves, L. C., Freitas, C. L. de, Ensslin, L., Pfitscher, E. D., Petri, S. M. & Ensslin, S. R. (2013). Gestão ambiental e sustentabilidade em instituições de ensino superior: construção de conhecimento sobre o tema. *Revista Gestão Universitária na América Latina – GUAL, 6*, 33-54.

Christensen, P., Thrane, M., Herreborg Jørgensen, T., & Lehmann, M. (2009). Sustainable development: Assessing the gap between preaching and practice at Aalborg University. *International Journal of Sustainability in Higher Education*, *10*(1), 4-20.

De Resende Lara, P. T. (2012). Sustentabilidade em Instituições de Ensino Superior. *Revista Monografias Ambientais (Fechada para submissões por tempo indeterminado), 7*(7), 1646-1656.

Engelman, R., Guisso, R. & Fracasso, E. M. (2009). Ações de gestão ambiental nas Instituições de Ensino Superior: o que tem sido feito. *RGSA – Revista de Gestão Social e Ambiental, 3*(1).

Ensslin, S. R., Ensslin, L., Imlau, J. M. & Chaves, L. C. (2014). Processo de mapeamento das publicações científicas de um tema: portfólio bibliográfico e análise bibliométrica sobre avaliação de desempenho de cooperativas de produção agropecuária. *Revista de Economia e Sociologia Rural (Impresso), 52*(1), 587-608.

Freitas, C. L. (2013). *Avaliação de Sustentabilidade em Instituições Públicas Federais de Ensino Superior (IFES): proposição de um modelo baseado em sistemas gerenciais de avaliação e evidenciação socioambiental*. Dissertação de mestrado, Contabilidade, Universidade Federal de Santa Catarina, Florianópolis.

Frizzo, K., Motke, F. D., Machado, E. C., Silva, Y. C., Ávila, L. V. & Zamberlam, J. F. (2014). Análise das práticas de Gestão Ambiental das Instituições de Ensino Superior. *Revista Eletrônica em Gestão, Educação e Tecnologia Ambiental (Fechada para submissões por tempo indeterminado), 18*(1), 196-208.

Gondim, S. M. G. (2002). Perfil profissional e mercado de trabalho: relação com a formação acadêmica pela perspectiva de estudantes universitários. *Estudos de psicologia, 7*(2), 299-309.

Hart, S. L. & Milstein, M. B. (2004). Criando valor sustentável. *RAE executivo, 3*(2), 65-79.

Jacobi, P. (2003). Educação ambiental, cidadania e sustentabilidade. *Cadernos de pesquisa, 118*(3), 189-205.

James, M. & Card, K. (2012). Factors contributing to institutions achieving environmental sustainability. *International Journal of Sustainability in Higher Education, 13*(2), 166-176.

Khoury, G., Rostami, J. & Turnbull, P. L. (1999). *Corporate social responsibility: Turning words into action*. Conference Board of Canada.

Lima, T. C. S. de & Mioto, R. C. T. (2007). Procedimentos metodológicos na construção do conhecimento científico: a pesquisa bibliográfica. *Revista Katalysis, 10*, 35-45.

Lozano, R., Lukman, R., Lozano, F. J., Huisingh, D. & Lambrechts, W. (2013). Declarations for sustainability in higher education: becoming better leaders, through addressing the university system. *Journal of Cleaner Production, 48*, 10-19.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

56

Luiz, L. C., Alberton, L., Da Rosa, F. S. & Pfitscher, E. D. (2014). Inclusão de Práticas Ambientais nas Auditorias Realizadas no Âmbito de uma Instituição Federal de Educação. *Revista de Gestão Ambiental e Sustentabilidade: GeAS, 3*(2), 92-112.

Luiz, L. C., Rau, K., Freitas, C. L. & Pfitscher, E. D. (2013). Agenda Ambiental na Administração Pública (A3P) e práticas de sustentabilidade: estudo aplicado em um instituto federal de educação, ciência e tecnologia. *Administração Pública e Gestão Social, 5*(2), 114-134.

Maimon, D. (1999). *ISO 14001 – Passo a passo da implantação nas pequenas e médias empresas*. Rio de Janeiro: Qualitymark Editora Ltda.

Matos, A., Cabo, P., Ribeiro, M. I. & Fernandes, A. (2015). As instituições de ensino superior perante a problemática ambiental. *EduSer - Revista de educação, 7*(2), 13-40.

Moura-Leite, R. & Padgett, R. (2014). The effect of corporate social actions on organizational reputation. *Management Research Review, 37*(2), 167-185.

Nascimento, L. F., Lemos, Â. D. da C. & Mello, M. C. A. de. (2008). *Gestão socioambiental estratégica*. Porto Alegre: Bookman.

Otero, G. G. P. (2010). *Gestão Ambiental em Instituições de Ensino Superior: práticas dos Campi da Universidade de São Paulo*. Dissertação de mestrado, Programa de Pós-Graduação em Ciência Ambiental, Universidade de São Paulo, São Paulo.

Portal Brasil. (2015a). *Agenda de Desenvolvimento Sustentável é adotada por unanimidade na ONU*. Recuperado em 02 janeiro 2017, de http://www.brasil.gov.br/meio-ambiente/2015/09/agenda-de-desenvolvimento-sustentavel-e-adotada-por-unanimidade-na-onu

Portal Brasil. (2015b). *Novo acordo global deve ter força de lei, defende Dilma na COP21*. Recuperado em 02 janeiro 2017, de http://www.brasil.gov.br/meio-ambiente/2015/11/novo-acordo-global-deve-ter-forca-de-lei-defende-dilma-na-cop21

Rosa, F. S. da, Ensslin, S. R. & Ensslin, L. (2009). Evidenciação Ambiental: Processo Estruturado de Revisão de Literatura sobre Avaliação de Desempenho da Evidenciação Ambiental. *Sociedade, Contabilidade e Gestão*, *4*(2).

Rubbo, P., Pilatti, L. A., Telles, L. B., Bittencourt, J. V. M., & De Francisco, A. C. (2016). Sustentabilidade organizacional: Uma análise da produção científica da base Scopus no período de 2005 a 2014. *Revista ESPACIOS/ Vol. 37 (Nº 13) Año 2016*.

Senado Federal. (2015). *Acordo na COP-21 com metas obrigatórias aos países pode ser "histórico", diz Vanessa*. Recuperado em 02 janeiro 2017, de http://www12.senado.leg.br/noticias/materias/2015/12/10/acordo-com-metas-obrigatorias-aos-paises-na-cop-21-pode-ser-historico-diz-vanessa/tablet

Shriberg, M. P. (2002a). Institutional assessment tools for sustainability in higher education: Strengths, weaknesses, and implications for practice and theory. *Higher Education Policy, 15*(2), 153-167.

Shriberg, M. P. (2002b). *Sustainability in U.S. higher education: organizational factors influencing campus environmental performance and leadership*. Tese de doutorado, University of Michigan, Michigan.

Tasca, J. E., Ensslin, L., Ensslin, S. R. & Alves; M. B. M. (2010). An approach for selecting a theoretical framework for the evaluation of training programs. *Journal of European Industrial Training, 34*(7), 631-655.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

57

Tauchen, J. & Brandli, L. L. (2006). A gestão ambiental em instituições de ensino superior: modelo para implantação em campus universitário. *Gestão & Produção, 13*(3), 503-515.

Taylor & Francis Online. (2017). *Economic Systems Research*. Recuperado em 04 maio 2017, de http://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=cesr20

Valmorbida, S. M. I., Ensslin, S. R., Ensslin, L. & Bortoluzzi, S. C. (2011). Gestão Pública com foco em resultados: Evidenciação de oportunidades de pesquisa. *Revista CAP - Accounting and Management, 5*(5), 126-136.

Valmorbida, S. M. I., Ensslin, S. R., Ensslin, L. & Ripoll-Feliu, V. M. (2014). Avaliação de Desempenho para Auxílio na Gestão de Universidades Públicas: Análise da Literatura para Identificação de Oportunidades de Pesquisas. *Contabilidade, Gestão e Governança, 17*(3), 04-28.

Vaz, C. R., Ionamata, D. O. & Stiirmer, J. C. (2014). Estado da arte do gerenciamento de resíduos sólidos em instituições de ensino superior: uma revisão de literatura. *Anais do Congresso de Gestão Ambiental*, Belo Horizonte, Minas Gerais, Brasil, 5.

Velazquez, L., Munguia, N., & Ojeda, M. (2013). Optimizing water use in the University of Sonora, Mexico. *Journal of Cleaner Production*, *46*, 83-88.

Viebahn, P. (2002). An environmental management model for universities: from environmental guidelines to staff involvement. *Journal of Cleaner Production, 10*(1), 03-12.

ANEXO I

Portfólio Bibliográfico

Agamuthu, P., Kasapo, P. & Nordin, N. A. M. (2015). E-waste flow among selected institutions of higher learning using material flow analysis model. *Resources, Conservation and Recycling, 105*, 177-185.

Alshuwaikhat, H. M. & Abubakar, I. (2008). An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. *Journal of Cleaner Production, 16*(16), 1777-1785.

Baboulet, O. & Lenzen, M. (2010). Evaluating the environmental performance of a university. *Journal of Cleaner Production, 18*(12),1134-1141.

Barnes, P. & Jerman, P. (2002). Developing an environmental management system for a multiple-university consortium. *Journal of Cleaner Production, 10*(1), 33-39.

Beringer, A. (2007). The Lüneburg sustainable university project in international comparison: An assessment against North American peers. *International Journal of Sustainability in Higher Education, 8*(4), 446-461.

Carpenter, D. & Meehan, B. (2002). Mainstreaming environmental management: case studies from Australasian universities. *International Journal of Sustainability in Higher Education, 3*(1), 19-37.

Christensen, P., Thrane, M., Herreborg Jørgensen, T. & Lehmann, M. (2009). Sustainable development: Assessing the gap between preaching and practice at Aalborg University. *International Journal of Sustainability in Higher Education, 10*(1), 04-20.

Clarke, A. (2006). The campus environmental management system cycle in practice: 15 years of environmental management, education and research at Dalhousie University. *International Journal of Sustainability in Higher Education, 7*(4), 374-389.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

58

Clarke, A. & Kouri, R. (2009). Choosing an appropriate university or college environmental management system. *Journal of Cleaner Production, 17*(11), 971-984.

Cruz, L., Barata, E., Ferreira, J. P. & Freire, F. (2017). Greening transportation and parking at University of Coimbra. *International Journal of Sustainability in Higher Education, 18*(1), 23-38.

De Vega, C. A., Benítez, S. O. & Barreto, M. E. R. (2008). Solid waste characterization and recycling potential for a university campus. *Waste management, 28*, S21-S26.

Disterheft, A., Da Silva Caeiro, S. S. F., Ramos, M. R. & De Miranda Azeiteiro, U. M. (2012). Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions–Top-down versus participatory approaches. *Journal of Cleaner Production, 31*, 80-90.

Fisher, R. M. (2003). Applying ISO 14001 as a business tool for campus sustainability: A case study from New Zealand. *International Journal of Sustainability in Higher Education, 4*(2), 138-150.

Gómez, N., Cadarso, M. Á. & Monsalve, F. (2016). Carbon footprint of a university in a multiregional model: the case of the University of Castilla-La Mancha. *Journal of Cleaner Production, 138*, 119-130.

Graedel, T. E. (2002). Quantitative sustainability in a college or university setting. *International Journal of Sustainability in Higher Education, 3*(4), 346-358.

James, M. & Card, K. (2012). Factors contributing to institutions achieving environmental sustainability. *International Journal of Sustainability in Higher Education, 13*(2), 166-176.

Koester, R. J., Eflin, J. & Vann, J. (2006). Greening of the campus: a whole-systems approach. *Journal of Cleaner Production, 14*(9), 769-779.

Krizek, K. J., Newport, D., White, J. & Townsend, A. R. (2012). Higher education's sustainability imperative: how to practically respond?. *International Journal of Sustainability in Higher Education, 13*(1), 19-33.

Larrán Jorge, M., Herrera Madueño, J., Calzado, Y. & Andrades, J. (2016). A proposal for measuring sustainability in universities: a case study of Spain. *International Journal of Sustainability in Higher Education, 17*(5), 671-697.

Lukman, R., Tiwary, A. & Azapagic, A. (2009). Towards greening a university campus: The case of the University of Maribor, Slovenia. *Resources, Conservation and Recycling, 53*(11), 639-644.

Muller, I. & Tempelhoff, J. (2016). The application of a resilience assessment approach to promote campus environmental management: a South African case study. *International Journal of Sustainability in Higher Education, 17*(2), 228-245.

Nicolaides, A. (2006). The implementation of environmental management towards sustainable universities and education for sustainable development as an ethical imperative. *International Journal of Sustainability in Higher Education, 7*(4), 414-424.

Petratos, P. & Damaskou, E. (2015). Management strategies for sustainability education, planning, design, energy conservation in California higher education. *International Journal of Sustainability in Higher Education, 16*(4), 576-603.

Ramírez Lara, E., De La Rosa, J. R., Ramírez Castillo, A. I., Cerino-Córdova, F. D. J., López Chuken, U. J., Fernández Delgadillo, S. S. & Rivas-García, P. (2017). A comprehensive hazardous waste management program in a Chemistry School at a Mexican university. *Journal of Cleaner Production, 142*, 1486-1491.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

59

Richardson, G. R. A. & Lynes, J. K. (2007). Institutional motivations and barriers to the construction of green buildings on campus: A case study of the University of Waterloo, Ontario. *International Journal of Sustainability in Higher Education, 8*(3), 339-354.

Sammalisto, K. & Arvidsson, K. (2005). Environmental management in Swedish higher education: directives, driving forces, hindrances, environmental aspects and environmental co-ordinators in Swedish universities. *International Journal of Sustainability in Higher Education, 6*(1), 18-35.

Sammalisto, K. & Brorson, T. (2008). Training and communication in the implementation of environmental management systems (ISO 14001): a case study at the University of Gävle, Sweden. *Journal of Cleaner Production, 16*(3), 299-309.

Savely, S. M., Carson, A. I. & Delclos, G. L. (2007). A survey of the implementation status of environmental management systems in US colleges and universities. *Journal of Cleaner Production, 15*(7), 650-659.

Savely, S. M., Carson, A. I. & Delclos, G. L. (2007). An environmental management system implementation model for US colleges and universities. *Journal of Cleaner Production, 15*(7), 660-670.

Shriberg, M. (2002a). Institutional assessment tools for sustainability in higher education: strengths, weaknesses, and implications for practice and theory. *Higher Education Policy, 15*(2), 153-167.

Shriberg, M. (2002b). Toward sustainable management: the University of Michigan Housing Division's approach. *Journal of Cleaner Production, 10*(1), 41-45.

Smyth, D. P., Fredeen, A. L. & Booth, A. L. (2010). Reducing solid waste in higher education: The first step towards 'greening'a university campus. *Resources, Conservation and Recycling, 54*(11), 1007-1016.

Soares, N., Dias Pereira, L., Ferreira, J., Conceição, P. & Pereira da Silva, P. (2015). Energy efficiency of higher education buildings: a case study. *International Journal of Sustainability in Higher Education, 16*(5), 669-691.

Townsend, J. & Barrett, J. (2015). Exploring the applications of carbon footprinting towards sustainability at a UK university: reporting and decision making. *Journal of Cleaner Production, 107*, 164-176.

Tu, Q., Zhu, C. e Mcavoy, D. C. (2015). Converting campus waste into renewable energy – A case study for the University of Cincinnati. *Waste Management, 39*, 258-265.

Velazquez, L., Munguia, N. & Ojeda, M. (2013). Optimizing water use in the University of Sonora, Mexico. *Journal of Cleaner Production, 46*, 83-88.

Velazquez, L., Munguia, N., Platt, A. & Taddei, J. (2006). Sustainable university: what can be the matter?. *Journal of Cleaner Production, 14*(9), 810-819.

Viebahn, P. (2002). An environmental management model for universities: from environmental guidelines to staff involvement. *Journal of Cleaner Production, 10*(1), 03-12.

Zen, I. S., Subramaniam, D., Sulaiman, H., Saleh, A. L., Omar, W. & Salim, M. R. (2016). Institutionalize waste minimization governance towards campus sustainability: A case study of Green Office initiatives in Universiti Teknologi Malaysia. *Journal of Cleaner Production, 135*, 1407-1422.

Zhang, N., Williams, I. D., Kemp, S. & Smith, N. F. (2011). Greening academia: Developing sustainable waste management at Higher Education Institutions. *Waste management, 31*(7), 1606-1616.

Rev. Gest. Ambient. Sustentabilidade, São Paulo, v.8, n.1, p. 38-60, jan./abr. 2019

60