An Integrated Sustainability Management Approach for Universities

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Abstract

Sustainability has become a recognized important sector and the main concern in our modern life. The attention towards sustainability was particularly increased when the United Nation set the target of achieving the 17 sustainable development goals by 2030. The universities' role cannot be ignored in promoting sustainability but to play this role effectively, the universities need to be sustainable first. This article aims to describe a sustainability framework and suggest the process to use the proposed sustainability. A qualitative research method using a systematic review approach, semi-structured interviews, and email interviews was adopted to achieve the aims and objectives of this research. The initial data was collected from 39 papers extracted from four main databases. This was further subjected to semi-structured interviews held with a total of 11 sustainability experts working in different universities globally. A framework for sustainability in universities consisting of three main components related to the environment, Social responsibility and teaching and research is finally developed and validated through email interviews held with 19 heads of different universities around the world. Each of the main sustainability components is divided into sub-factors. Longitudinal studies are recommended to evaluate the impact of the proposed framework on university sustainability.

Keywords: Sustainability, Conservation, Environment.

1. Introduction:

Sustainability is one of the main concerns for most countries around the world and has been clearly evident in the global forum. The United Nations Sustainable Development Goals which consist of 17 goals, supported by 169 targets and underpinned by 230 global indicators is one of the main indications that how sustainability is considered an important issue globally (UN SDGs, 2017; Umar et al., 2020). The United Nations aims to achieve these goals by 2030. One of the UN sustainable development goals is the quality education (Goals 4). Quality education can provide a strong foundation for sustainable development. Goal 4 (Quality Education) has a total of ten targets that the UN member countries want to achieve by 2030. These targets ensure that everyone has access to quality and affordable education of their desired. Such education may include basic education, vocational training, and university level education (Lu et al., 2015). This is, however, could not be achieved without promoting sustainability in universities and other educational institutions. Once the educational institutions will be able to use their resources in a sustainable way, their annual expenditure could be reduced and thus the reduction in the cost of operation will result in a reduction in the cost of education. This is, however, appears not to be very simple and straight forward as there are still some countries around the world that are in the appraisal stage of sustainability. For instance, Umar and Egbu (2018-a), while discussing UN SDGs, argued that although most of the countries have submitted their intended action plans to achieve these goals, there are still few countries who are still in the appraisal stage of their plans

and have not yet submitted it the UN. While it is now 5 years since the UN has adopted the SDGs, none of the countries is on track to achieve all of these goals by 2030 (Sachs et al., 2019). This is quite a serious situation as we are closed to the target and if these goals would not be achieved then it will have an impact on the UN millennium goals (UNMGs, 2019). The universities, however, have an important role to play to achieve these goals, but the universities first have to integrate sustainability in their local environment and in teaching and research (Beynaghi et al., 2016). It is a universal fact that the way the earth resources are utilized these days is considered as non-sustainable. If all the 7.3 billion of Earth's people consumed the earth resources at the same rate as the average American, it would take six planets to support them (Kibert, 2016). Individuals' contributions and organizational commitment are considered significantly important to achieve a desired level of sustainability. There is a global need to propose a more suitable integrated approach to achieve sustainability at educational institutions that could remedy the limitations of the current environmental management practices. This article puts light on the approach of sustainability and highlights the need for universities to be sustainable. The article further describes some of the key aspects of achieving sustainability at a university by proposing an integrated approach. There is a possibility to achieve more sustainability through the integration of three strategies, namely; university environmental management system (EMS); public participation and social responsibility; and promoting sustainability in teaching and research. The next section sheds light on the background of sustainability in higher education institutions.

1.1. Background of Sustainability in Universities:

Universities can nowadays be known as 'small cities' due to their large size, population, and the various complex activities taking place on campuses. Thus due to its large size and activities take placed in the universities, the impact on the environment cannot be ignored (Lozano et al., 2015). The damage and degradation made by the higher educational institutions in the form of energy and materials utilization in different activities and operations in teaching and research, and through support services in the residential area (dormitory) can be significantly reduced by adopting an effective technical solution (Savely et al., 2007). Using renewable energy resources could be one of the best options for the universities but also for the whole earth to reduce their emissions and carbon footprint (Geng et al., 2013; Umar and Wamuziri, 2016). Different studies show that there is considerable potential in the different form of renewable energy recourse such as wind, solar, geothermal and most of the region biomass, universities are, however, not getting the full benefits of these resources (Bird et al., 2016; Byrne et al., 2015; Umar, 2018-a; Umar, 2018-b; Umar et al., 2019; Umar, 2017-a). Although many environmental protection measures can be seen at some universities, a more systematic and sustainable approach to reducing the negative impacts of those activities and making the campuses more sustainable, is generally lacking (Alshuwaikhat and Abubakar, 2008). The UNESCO, Stockholm Declaration of 1972 was the first to make reference

to sustainability in higher education and has recognized the interdependency between humanity and the environment and suggests several ways of achieving environmental sustainability (UNESCO, 1972). A sustainable university was thus defined by Velazquez et al. (2006) as ‘‘a higher educational institution, as a whole or as a part, that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles’. Newman (2006) noted that there is a common understanding in the literature that a sustainable university implies a better balance between economic, social and environmental goals in policy formulation as well as a long-term perspective about the consequences of today’s campus activities. Recent research conducted by Yáñez et al. (2019) on sustainability reporting in higher education, considered the management aspect in the transmission of sustainability values throughout the entire organization. This aspect of organization commitment which is highly influenced by the management was also viewed as an important factor in achieving the organization’s goals (Umar and Egbu, 2018-b; Umar and Wamuziri, 2017). Similarly, Lozano (2011) considered sustainability reporting in universities and concluded that it is still in the early stages as compared to the reporting system in other organizations. A recent study on sustainable development policies considering the universities in Brazil, Germany, Greece, Portugal, South Africa, the United Kingdom and the United States of America, concluded that only 60% of the sampled universities had a policy that specifically addressed sustainable development (Leal Filho, et al., 2018). This clearly reflects that universities around the world are lacking having an effective sustainable development policy. The situation could be worse in developing countries. It is also important to understand how the universities responding to the societal challenge of sustainability and what are the universities' contributions to achieving global sustainability goals (Soini et al., 2018). In this regard, the definition of sustainability in the context of universities would play a significant role. and suggested that without a clear definition, there could be misalignment between target and expectation (Daniel, 2015; Umar, 2017-b). Overall, the above discussion reveals that sustainability in universities is considered an important element to pave the road in achieving global sustainability.

The next section describes the sustainability approaches for higher educational institutions.

1.2. Sustainability Practices in Different Universities:

Generally, sustainability is considered to have three dimensions related to economic, environment and society, but universities are expected to have another dimension of sustainability which can be named as ‘organizational activities. These activities as reported by Amaral et al., (2015), include education, research, operations, community outreach, and reporting. Some researchers viewed the ‘safety and health’ of peoples connected in an organization, as an element of sustainability (Esquer-

Peralta et al., 2008; Bhinge et al., 2015). A healthy and safe human being will be more productive and will contribute to society more effectively (Yi and Chan, 2016).

Over the past two decades, many universities have taken a more responsible approach to manage their environmental performance and improve their environmental sustainability. The three widely used approaches are green building initiative, ISO 14001 and the European Eco-Management and Audit Scheme (EMAS). The green building initiative represents a sustainable design concept, because buildings have a significant impact on the environment, accounting for one-sixth of the world's freshwater withdrawals, one-quarter of its wood harvest, and two-fifths of its material and energy, leaving a large negative impact on the environment and health (Cortese, 2005). Another practice widely employed by universities in achieving sustainability is the ISO 14001 standard, which has been implemented by a large number of universities in the USA and Europe (ISO 14001:1996). This standard is recognized corporate-wide to advise and apply environmental goals, policies, and responsibilities, as well as regular auditing of its factors (Balzarova et al., 2006; Balzarova and Castka, 2008). Simkins and Nolan (2004) indicated the objective of this standard as;

- To reduce waste, resource depletion, and environmental pollution;
- To promote environmental awareness among employees and within the community;
- To provide a platform for companies to demonstrate their commitment to environmental protection;
- To help management pursue continual improvement in environmental performance;
- To provide a worldwide focus on environmental management;
- To promote a voluntary, consensus standard approach for environmental issues;
- To demonstrate a commitment to moving beyond regulatory compliance.

The third approach toward sustainability known as EMAS was developed in 1993. It was specifically designed to bring changes in environmental performance (Morrow and Rondinelli, 2002). The EMAS has been regarded for improvements in the environmental management systems of different organizations. Adopting any of these sustainability management systems alone will not ensure sustainability due to several weaknesses of each system. Apart from this, different dimensions and complexity of environmental problems require a more proactive attitude and the development of integrated solutions. Thus, it is necessary that universities should adopt a systematic and integrated system that would look into all sustainability issues. This fact has been evident by the Soini et al., (2018) in their exploratory study of 44 centers of sustainability's established in different universities around the world. They noted that most of these centers (31) considered in their study were established between 2006 and 2016. The outreach activities were classified into six

different categories as shown in figure 1. Overall, these activities are broadly liked into three categories which could be a base for an integrated sustainability approach.

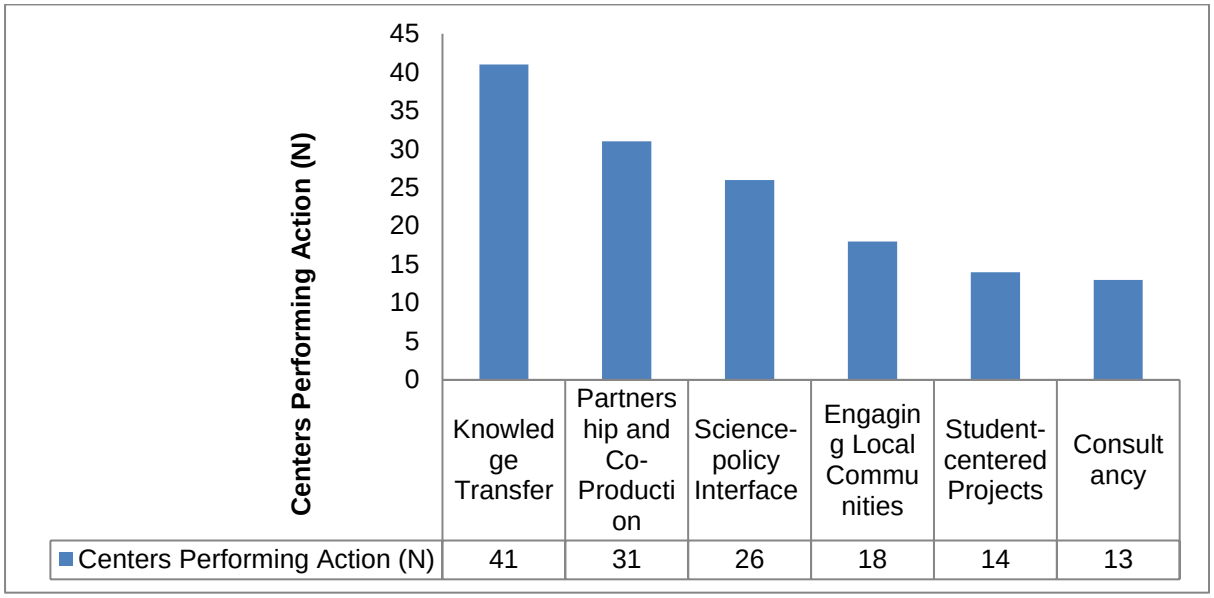

Figure 1: Out Reach Activities of Different Research Centers (Soini et al., 2018)

The next section explains the research strategy adopted to achieve the aims and objectives of this research.

2. Research Methodology:

To achieve the research objective of set in the paper, a qualitative research method consisting of a systematic literature review, semi-structured interview, and email interview was adopted. Briefly, a qualitative research approach stresses on words and contexts despite quantification in data collection (Opdenakker, 2006; Umar and Egbu, 2020). It stresses an introductory approach in the relationship between theory and research and focus is settled on the formation of theories. The process of qualitative research guided by Bryman (2016) is commonly adopted by researchers in such studies. For the systematic review, a period of past 10 years, from 2009 to 2019 was considered being aligned with the period of the development and adaptation of UN SDGs. Four main databases that include Web of Science, Scopus, ProQuest, and Science Direct were used. Such databases for the systematic review were also used in a number of studies (Michalek et al., 2017; Martins et al., 2019). Different keywords including “sustainability in universities”, “environmental management systems”, “environmental management model for universities”, “environmental sustainability”, and “university environmental management system” were used for the search purposes. The inclusion criteria include that the keywords should be either, in the title, abstract or in the keywords of the papers. The selection criteria also include that the paper should be written in English and it should focus on

sustainability in higher educational institutions. The Preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines as outlined by (Moher et al., 2009) were adhered during the review process. The PRISMA compliance in the literature review was considered important in many studies (Welch et al., 2016; Wang et al., 2019). The items identified in this review were ranked based on the citations of the articles and the number of times the factor appears in the papers. Each of the ranking criteria was given a 50% weightage. The purpose of the systematic review was to extract the key sustainability factors from the existing literature and to provide a base for the next stage of the research.

For the semi-structured interview, a total of 20 sustainability experts were identified using a Google search. The sample size of 20 respondents is justified by the number of studies. For instance, Mason (2010) reported the result of five hundred and sixty qualitative studies and noted that the most common size of the sample in these studies was 20. The criteria for the shortlisting of the participants for this interview was the candidate should at least have a minimum of 10 years' experience in the area of sustainability relevant to the universities. They were contacted through their email address asking their participation in the study. The aims, objectives and the list of the questions were sent to them through email. Their email addresses were found on their employer's website. The purpose of this interview was to seek the view of the sustainability expert on the different factors identified from the literature review so that it can be used in the development of the final framework. Interview questions were asked in the same way by keeping the sequence of questions similar in all interviews. Manual notes were made in each interview for recording their responses. Data was collected in a manner to which the content analysis technique can be applied easily. This includes coding the whole text/ script, identifying the themes with broader patterns of meaning and defining and naming each of the themes (Graneheim and Lundman, 2004; McIntosh and Morse, 2015).

In the final stage of the research, the developed framework for sustainability was sent to 50 universities for their feedback using the email interview practice as described by Burns (2010). The heads of these universities were requested to review this framework in relation to its possible implementation and adaptation in their organization. They were also asked to provide feedback on the effectiveness of this framework considering its effectiveness for their organizations.

The results and analysis of the study are presented in the next section.

3. Results and Analysis:

Considering the different research approaches, the results and analysis are divided into two categories as outlined in section 3.1 and 3.2.

3.1. Results and Analysis of Systematic Review:

A total of 285 records were identified using the described databases and the time as mentioned in table 1. The highest number of records were identified from the Web of Science (29.47%), followed by Scopus (27.71%), ProQuest (22.10%) and Science Direct (20.70%). At the first screening stage, duplicate items (86) were removed thus the eligible items for the next stage stood at 199 items. In the next stage of the screening process, the records were further checked considering their titles, abstracts, and keywords. In this stage, a total of 79 items were excluded. In the eligibility stage, the records were finally screened on the eligibility criteria mentioned in the research methodology section. In this stage, the items were thoroughly reviewed with their relevance to the universities or higher educational institutions. The eligibility stage resulted in the rejection of 81 items. The final items considered in the qualitative and quantitative synthesis was therefore 39 items.

Database/Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Web of Science	6	10	9	6	10	5	12	5	4	11	6	84
Scopus	8	7	11	5	4	7	9	2	9	12	5	79
ProQuest	4	4	3	7	6	4	11	4	2	8	10	63
Science Direct	6	2	7	2	2	8	8	6	7	6	5	59
Total	**24**	**23**	**30**	**20**	**22**	**24**	**40**	**17**	**22**	**37**	**26**	**285**

Table 1: Initial Items Found from Systematic Review

A total of 14 sustainability factors as shown in table 2 were identified through this systematic review. These factors were ranked using the criteria mentioned in section 2. Waste reduction was on the top of the list as Comprehensive solid waste management systems are one of the greatest challenges in achieving sustainability in the universities (Smyth et al., 2010). Effective waste management systems can help the universities to implement and then achieve the zero waste strategy (Ebrahimi, and North, 2017). Similarly, recycling facilities along with positive environmental behavior is important for universities to achieve sustainable resource use (Mtutu and Thondhlana, 2016). The results of a study conducted in South Africa shows that paper usage could be significantly reduced through encouraging recycling and reusing behavior among the students and staff (Amutenya et al., 2009). Similarly, the research conducted by Pritoni et al. (2017) on energy efficiency noted that only heating, ventilation, and air-conditioning (HVAC) systems use more than half of the energy consumption in many buildings on university campuses in the United States. They suggested the manual and automatic methods that can be linked to the user thermal comfort to achieve enhance energy efficiency in university campuses. The research conducted by Song et al. (2017) proposes the energy-efficient course timetabling to save energy. Their experimental study considering some universities shows that an optimal timetable can produce up to 5% energy saving during cooling and heating season compared to the existing timetable. By reducing waste, promoting recycling, and adopting energy efficiency, the universities

not only reduce the impact on the environment but also contribute towards economic growth (Gillingham et al., 2016).

Promoting sustainability in teaching and research was also one of the factors identified through the systematic literature review. The research conducted by Ralph and Stubbs (2013) explored the factors that influence the integration of sustainability into the operations, teaching and research activities of universities in Australia and England. They concluded that factors such as strong environmental policy, resourcing of strategies and encouragement of leaders are of critical importance to enable universities to achieve environmental sustainability. Sustainability also required to be incorporated in the teaching considering the scope of the discipline. The current practice of sustainability teaching in universities appears to be more relevant to environmental sustainability only; there is, therefore, a need to incorporate other aspects of sustainability in the curriculum that can bring creative pedagogy and acknowledge different people's views on the sustainability (Reid and Petocz, 2006). Similarly, the university commitment also needs to be reflected in their research action plan. Such action plans required to incorporate the learning and changes as both of them are critical to transform the culture. In this regard, the community action research approach can advance such changes as this approach can incorporate sustainability into the culture of the universities (Wooltorton et al., 2015).

One of the main and fundamental factors which reflect the commitment of universities towards sustainability is the building of the universities (Sonetti et al., 2016). Project delivery and developments, certifications, energy performance, and the use of advanced technologies are some of the key factors of the green building (Darko and Chan, 2016). The four main factors of green building for universities identified by Richardson and Lynes (2007) were (i) Internal leadership, (ii) Financial vision, (iii) Sustainability targets and (iv) Communications and collaborations. The research conducted by Stafford (2010) reported the results of 180 universities in the United States and noted that the size and wealth of a university are significant factors in the adoption of sustainable practices. Similarly, common stakeholders such as faculty, alumni, and the surrounding community also play an important role in such practices. The university campuses are composed of large building and it is therefore important for universities to apply the sustainability concept to build and use its infrastructures (Amaral et al., 2015).

Apart from teaching and research, universities have a key role to create public awareness of sustainability (Too and Bajracharya, 2015). While universities have a key role to create public awareness on sustainability, there are studies that reflect that the main stakeholders, for instance, the students in some universities have little knowledge about the notion of sustainable development (Alghamdi, 2016). The approaches to engage with the community to enhance suitability can of different varieties; however, such engagement should need to focus on some of the common factors including psychological needs, physical facilities, personal motivations, public

perception, price mechanisms and policies (Too and Bajracharya, 2015). Recently, Chen (2018) summarized summarizes five key factors of artistic thinking for sustainability promotion that include novelty, criticism, perfectionism, uniqueness, and passion. Such approaches can be adopted by the universities to develop awareness for sustainability in the general public.

Sustainability Factor	**Score Based Citations = ∑ of All Citations x 0.5 = A**	**Score Based on the Number of Times the Factor Appears in the Papers = ∑ of Numbers x 0.5 = B**	**Final Score = A+B**	**Rank Based on final Score**
Waste Reduction	87.5	16	103.5	**1**
Recycling	81	15	96	**2**
Energy Efficiency	73	14.5	87.5	**3**
Negative Impact of Operation	71	15.5	86.5	**4**
Pollution Prevention	67.5	11	78.5	**5**
Resource Conservation	48	13	61	**6**
Environmental Improvement	46.5	10	56.5	**7**
Green Building	41	11	52	**8**
Public Awareness	36	12	48	**9**
Community Projects	39	7	46	**10**
Partnership with Organizations	35	10	45	**11**
Green Transportation	31.5	9	40.5	**12**
Sustainability in Teaching and Research	32	8	40	**13**
Equity	29	10	39	**14**

Table 2: Ranking of Sustainability Factors

The next section summarizes the results and analysis of semi-structured interviews held with sustainability professionals.

3.2. Results and Analysis of Semi-structured Interview:

The potential sustainability experts were contacted through email for cooperation in this research. They were provided the details of the research aims and objectives. The results from the existing review along with the interview questions, confidentiality, and consent statements were also sent to them. A total of one month's time was allowed to receive their response. During this one month period, two reminders were sent to those who had not responded to the email. After the one month time, the total interviewees who responded were 13. Finally, 12 candidates

participated in the interview, while one interviewee was unavailable during the interview time. The description of these interviewees is given below.

A total of four Interviewees were from different universities located in Europe. The first interviewee was the director of facility management in one of the leading universities in Europe. He was holding a Bachelor's degree in Environmental Engineering from a UK university. He was having more than 15 years' experience in different universities across Europe in a similar nature of work. Three interviewees were faculty members in two different universities. All of them were holding PhD qualifications. On average, they were holding more than 12 years' experience in teaching and research relevant to sustainability.

Four Interviewees were from different universities in the United States. The interviewee one from the United States was the Dean of the Engineering College in a leading university in the United States. He was holding more than 30 years' experience in different universities in the United States. Academically, he was holding a PhD degree in Engineering from a University in the United States and sustainability was one of his research interests. Two of the interviewees from the United States were holding administrative positions of Estate Officer in two different universities. One of them was holding a Master's degree in Civil Engineering and the other one was graduated with a Bachelor's degree in property management. Both of them were having more than 15 years' experience while working at different positions in universities. The fourth interviewee was a faculty member holding a PhD qualification and an experience of more than 20 years. Engineering sustainability was one of her research interests

Two interviewees were from a Gulf Cooperation Council (GCC) member country. Both of them were working in two different private higher education institutions. One of them was working as a facility manager having completed his master's degree in facilities management from a UK leading university. He was having more than 10 years' experience. The next interviewee from the GCC region was a faculty member with a total of 16 years' experience, out of which 5 years was within the GCC region.

The last two interviewees were from China and India. The Chinese interviewee was a faculty member in an engineering discipline and was holding a PhD qualification with more than 15 years' experience. The interviewee from India was working as a Civil Engineer in a leading Public Sector University. He was holding a Master's degree in civil engineering and an experience of more than 10 years while working in the same university. Facilities and resource management in the university fall under his responsibilities.

Despite the small number of interviews conducted in this research, the interview process provided in-depth information to explore and understand the sustainability in the universities. In general, the environment was one of the main focuses of the interviewees from the practicing group (group 1); some of the interviewees from the

same group also discussed the factors associated with green building, public awareness and their participation and community services. The factors associated with the environment highlighted by these interviewees were almost the same as discussed in section 3.1. Similarly, the interviewees from the academic group (group 2) not only focused on the environment and social aspects, but they also provided useful information on the integration of sustainability in the community services and in teaching and research. These interviewees also shed light on the social justice aspect of sustainability and noted that why such justice should be part of a system developed for sustainability in the universities.

While discussing green building and green transportation, two interviewees from group 2 also emphasized the preservation of the university buildings. They noted that most of the university buildings are aging and preservation will not only allow using these buildings for a long period of time, apart from other benefits related to economic and environment. Building preservation was also discussed by Young (2012) emphasizing that building preservation and reuse to have significant implications for reducing social, environmental, and economic pressures and thus improve sustainability. Some of the researchers also considered the teaching to the preservation of building to the sustainability students. It is, however, important to develop coursework and research agenda for the preservation programs that reflect a strong link with the sustainability (Chusid, 2010). Since building preservation was also highlighted by a number of interviewees from group 2; it was therefore considered as one of the important elements of sustainability in higher educational institutions.

Since public awareness and participation were considered by a number of interviewees as an important element of sustainability in the universities, they were asked how such awareness and participation could be achieved. The interviewees were in the consensus that environmental sustainability cannot be achieved without the participation of the university community. The university community includes students, staff, alumni, parents and other visitors. All the participants should have a clear idea of environmental sustainability. In fact, some of the interviewees argue that it is the university's responsibility to create such awareness among the community. To create such awareness, the universities can conduct training sessions for its staff, students and alumni. To research out the external community, the universities may organize public lectures and seminars to enhance environmental sustainability among the local community. Interviewees noted that such lectures and seminars need to open for the general public with no fee. One of the interviewees stresses on the industrial partners to enhance sustainability in the universities. Such a partnership is important for both industrial sectors and universities to explore the ways of sustainable development adopted by each stakeholder. Partnership for the sustainable development goals is so important that it is not only placed as one of the UN SDGs but currently a number of research studies

demonstrate good results from such partnership (Luo et al., 2018; Pattberg and Widerberg, 2016; Tebbutt et al., 2016).

Social justice for sustainability appears to be an important factor, however, it is rarely considered equal and important as of the other factors of sustainability. For instance, Krueger and Gibbs, (2007) emphasizes a balance among the 'three pillars' of economic vitality, environmental protection, and social equity, but Long, (2014) considered the widespread prioritization of the three pillars and noted that economy comes first, environment second, and social justice came in the last. Harrison and Palmer (2019) noted that social justice as a social pillar of sustainability which includes important elements such as diversity and inclusion, gender equality, and human rights. The interviewees from group 2 emphasized this element of sustainability and argued that there has to be a system in the universities that promotes equity. Infrastructures in the universities need to be disabled-friendly, and a specific quota in the employment in universities needs to be reserved for disabled applicants. Social justice needs to be improved by other initiatives such as a guaranteed interview scheme for the job seekers in the universities who have a known disability. Some of the interviewees from group 1 however, noted that handicap care in some cases is not the priority of the management.

One of the important elements of sustainability described by most of the interviewees from group 2 was the teaching and research. They noted that sustainability should be part of the programs that run in the universities and universities should develop research centers that promote sustainability. Courses need to be mapped with the program's requirement; however, some common courses such as sustainability, health and safety, livable settlement and renewable energy can be part of a variety of programs. Coleman et al., (2017) noted that higher educational institutions faculty members are now required to teach about sustainability. Many faculty members across different universities have already incorporated climate change knowing that climate change is arguably the biggest threat to global sustainability (McCright et al., 2013). Similarly, Nolet (2016) concluded that climate change has become an important concept often integrated into sustainability courses. Similarly, many universities provide online courses related to sustainability for which a variety of information and strategies could be used when preparing such curses (Zhan et al., 2015). The interviewees also agreed that the universities need to involve in the research and development studies. The common themes for the research and development reported by the interviewees were renewable energy, environment, and climate change. This is aligned with the finding of Olawumi and Chan, (2018) in which they have explored global sustainability research from 1991 to 2016. They, however, noted that the current global sustainability research also needs to incorporate the current technological aspect such as 3D printing, augmented reality, radio-frequency identification and geographical information system. Two of the interviewees from group 2 also highlighted the importance of conferences, seminars, and workshops related to sustainability. They argue that such activities allow the

universities to demonstrate the community their commitment to sustainability. The international conferences organized by the universities have been viewed by Berchin et al., (2018) as important strategies to promote various issues of sustainability, through sharing knowledge, experiences, projects, initiatives, and methods.

In relation to sustainability measurement in the universities, interviewees reported that this is a complex issue and different universities may approach it differently. Similarly, they also noted that for the measurement of sustainability, it is important the university set a clear target for a specific item of the sustainability and then measure that item in an agreed time interval. One of the interviewees explains this with an example. He noted that let say a university aims to reduce its waste. So the first thing is to know the current waste and how much they aim to reduce it. The university then needs to have a clear plan for this reduction. A minor reduction may require a short term plan; a medium reduction may need a long term plan while a zero-waste may require a long term plan. After implementing the concerned plan, the university needs to measure the total waste production and to see whether its plan was successful or not. Some of the aspects of sustainability will have a different criterion for measurement. For instance, public participation and awareness can be measured through a questionnaire. This is also to be decided that what level of satisfaction the university want from its community and how the university approach to achieve that level of satisfaction. Similarly, sustainability in teaching and research has its own parameters and dimensions which involve the commitment from the top management. Such activities are regarded as long terms, however, they can be more effective if enforced by the regulatory authority such as the Ministry of Higher Education of the country where the university exists. One of the interviewees revealed that in some countries educational ministries create comprehensive raking criteria in which sustainability in teaching and research is given due weightage. Such initiatives are more effective because it enforces universities to adopt sustainability in teaching and research. The universities also adhere to such criteria because it ultimately impacts their national ranking. One to the interviewee from group 2 also mentioned that for the universities to achieve excellence in all aspects of sustainability, they need to have a high level of commitment towards this. It is also important that such universities establish a high level of a committee or office to look after the sustainability issues.

Based on the results and discussion from the above sections, an integrated concept for sustainability in universities is developed and explained in the next section.

4. Integrated Sustainability Approach:

It is clear from the results and discussion from both parts of the research i.e. systematic review and semi-structured interviews that sustainability in universities includes a number of factors associated with the environment, public awareness and participation, and teaching and research. The first important thing which could lead a university towards a better level of sustainability is, however, the commitment of

university management. Organization or management commitment is the key to change to the culture of an organization and thus helps organizations and institutions to achieve the desired goals (Zohar, 1980; Cohen et al. 1975; Shafai-Sahrai, 1971; Cleveland et al., 1978; Umar et al., 2017). Therefore, a university that aims to promote sustainability needs to have a clear vision and the commitment of management towards sustainability. Such commitments are normally demonstrated by the universities by having an organizational structure, through either a department or a committee. The university also needs to provide the necessary resources required by such a department or committee to achieve the sustainability vision. When an organizational structure along with other required resources will be available, implementing a sustainability approach becomes easier. For a university to be sustainable, it must preserve the environment, stimulate economic growth, and contribute to society. It is, therefore, the duty of university management and the university community to ensure the university environment is sustainable so that the university can serve as a center for the promotion of global sustainability through its teaching and research for the benefit of all. The factors identified in this research are widely considered by many researchers as an integral part of achieving sustainability in universities. Based on the results and discussion of this research, these factors or dimensions are broadly divided into three categories for proposing the integrated approach for sustainability in universities. These three factors include a) Environmental Management System (EMS); b) Public participation and social responsibility; and c) Sustainability in teaching and research. Similar, factors for forecasting sustainability in the universities were also discussed by Shi and Lai, (2013). Each of the main factors mentioned in this research has some main initiatives derived from the existing literature and interviews. The integrated approach for sustainability shown in figure 2 could lead to achieving the sustainability mission of a university. Although sustainability is a complex issue and different organizations adopt their own strategies to achieve it, the interviews held with the sustainability expert provided a detailed insight into how the universities can achieve sustainability in three identified pillars. The interviewees agreed that the first important thing for the university is to know the current situation of a factor in the required pillar. For instance, waste reduction is a factor in the environmental pillar. So, the university needs to know what it is the current waste generation, either from the whole university or per capita, in one year or in one month. The university then needs to develop and implement a plan to reduce waste. The duration of the plan will depend on the actual amount of reduction. For instance, if the university desires to achieve zero-waste, then the plan is expected to be a long term plan. After the implementation of such plans, the waste needs to be measured again to see the plan was effective or not. If the plan was not effective, the university needs to take further corrective measures. It also needs to be noted that some factors in a different pillar of sustainability may need a different approach from the waste reduction factor; however, the overall strategy will be the same. For instance, public awareness or public participation would be better measured through a structured questionnaire. The proposed process on how universities could achieve its sustainability is briefly

described in figure 3. It is now the time for universities to prioritize the areas related to sustainability and set the target to achieve, maintain and enhance the key indicators associated with its sustainability. Apart from the financial benefits of improved sustainability, this will further help universities to serve as a center for the promotion of sustainability, both locally and internationally.

Finally, the proposed integrated sustainability framework was sent to a total of 50 universities located in the United States, Europe, China, GCC, and India. These universities were selected based on their international and regional ranking. The top 10 universities from each region were selected. The proposed framework along with its process, the aims and objectives of the research were sent to the head of the institutions. They were requested to provide feedback on the proposed approach of sustainability after it is reviewed by the head of the concerned institution or its representative. These institutions were particularly requested to provide their views on the strength of the prosed approach in terms of its dimensions and its coverage of sustainability of their intuitions. They were also asked for comments on the effectiveness of the approach and its proposed process. A total of one moth time was given to the respondents for their response. During this period, two reminders were sent to those who have not responded. These reminders were served to the respondents to increase the response rate as noted by Meho, (2006) that the use of reminders increases the response rate by five times. At the end of the described time, a total of 19 responses were received representing a response rate of 38%. A study conducted by Shih and Xitao (2008) considering the response rate in different studies noted that on average a web base survey response stood at 33.87%.

Overall, all the feedback received from the 19 respondents were positive. They noted that the proposed sustainability covers all the aspects related to the sustainability of their university. Two responded, however, highlighted some minor incorporation in the proposed approach related to social justice and community services. Their view was that social justice in a university is not only related to equity and handicap care, but there can be other initiatives that the universities can adopt. Similar feedback was also received related to community services. The proposed framework was there revised by adding the term “other services” in the community services and adding “other initiatives” in the social justice part as shown in figure 2. The majority of the respondents recommended the longitudinal studies based on the proposed framework to see the improvement of sustainability that the proposed framework can bring. Such longitudinal studies are, however, not covered in this research, it is, therefore, recommended as an area for further studies.

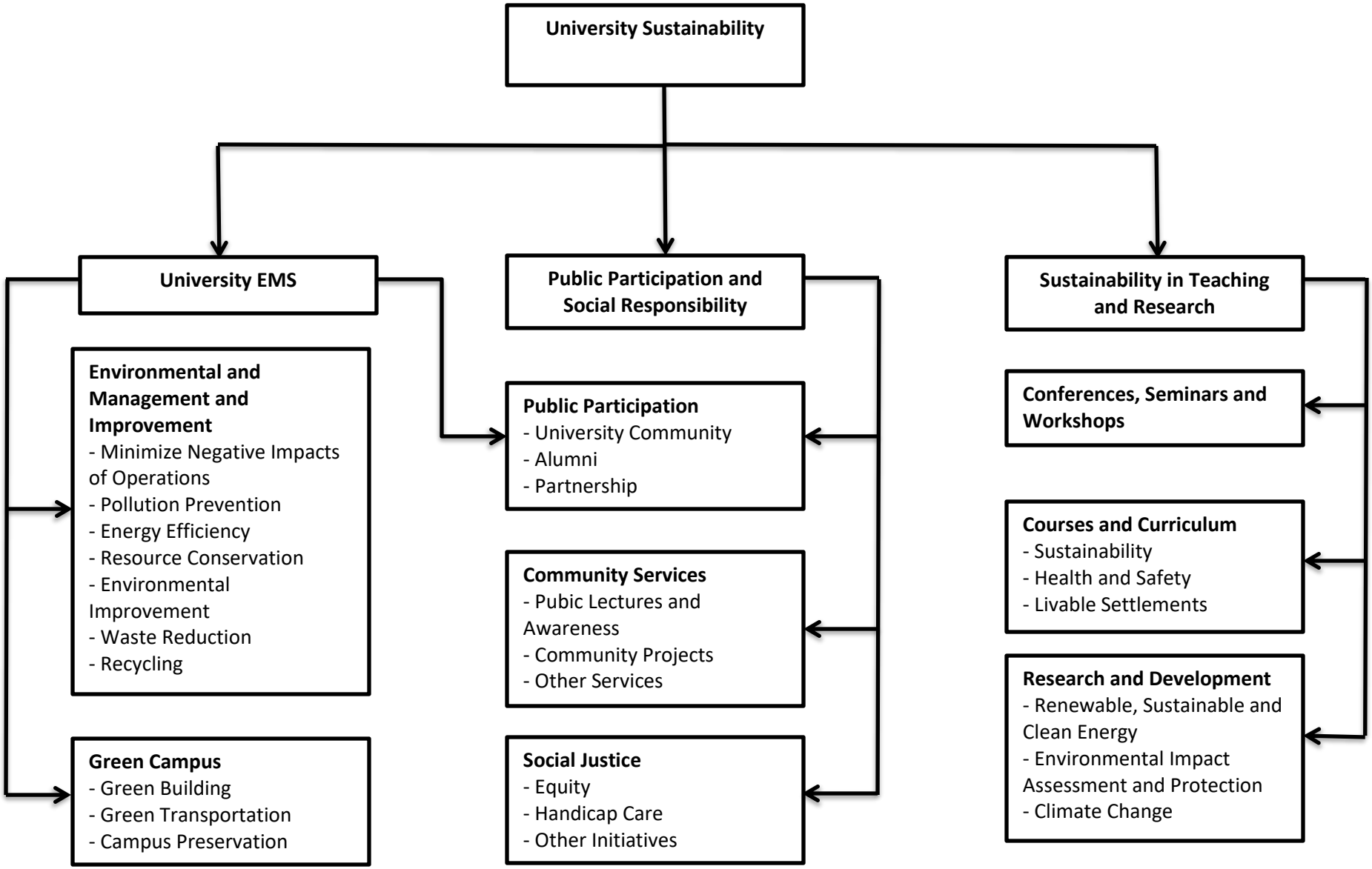

Figure 2: Proposed Frame Work for Sustainability in Universities

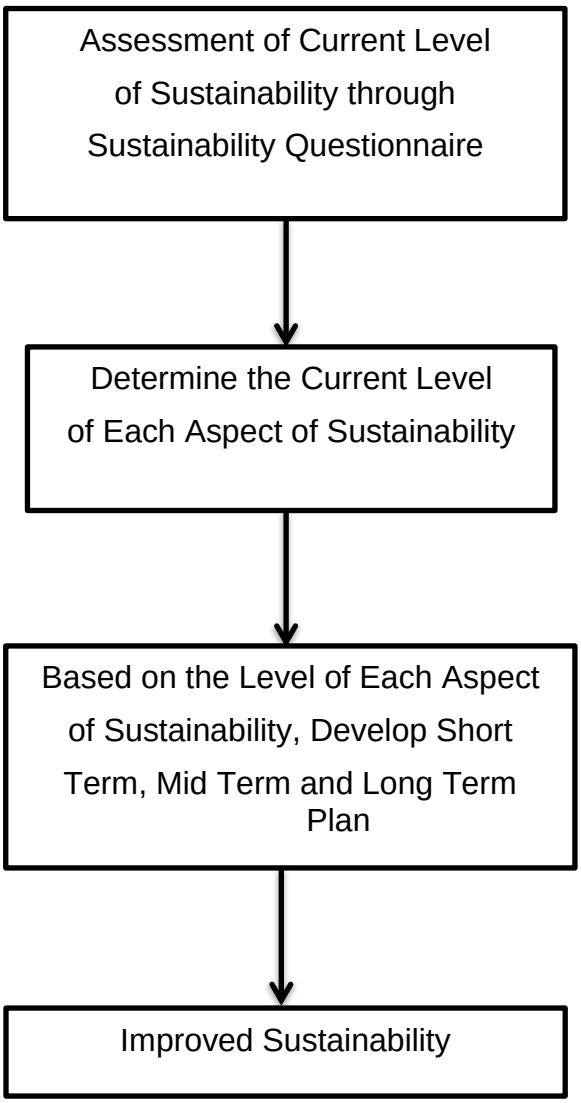

Figure 3: The Proposed Process of Improving Sustainability at Universities.

The next section provides a conclusion of the research.

5. Conclusion:

Considering the current threads of climate change and global warming, the universities' role in promoting sustainability around the world is crucial to preserve the earth. A university is formed by a community of individuals and its operations entail a wide range of facilities and activities. These include dormitories, restaurants, and all of the associated waste that they generate, chemicals that they consume, energy that they use, and much more. Despite the fact that operational activities can be seen as worthy examples of sustainable practices, they cannot by themselves be a guarantee of campus sustainability. They lack a systematic and continuous quality improvement approach that is the core of the standardized management systems. This article attempted to describe the key elements of sustainability in universities and proposed an integrated approach to achieve the desired level of sustainability. The research strategy adopted to achieve the aims and objectives of the paper was qualitative in nature that consists of a systematic review, semi-structured interviews, and email interviews. Most of the factors identified through the systematic review were related to the environment. The semi-structured interviews held with the sustainability experts working in different universities around the world provided a greater insight into the environmental factors as well as the factors related to society and teaching and research. The sample for the interviews was selected considering the sustainability experts involving both practitioners and academics. Finally, all the factors found from both the research strategies were considered in the development of the final framework for sustainability in the universities. These factors were broadly divided into three elements that include Environmental Management System, Public Participation and Social Responsibility, and Sustainability in Teaching and Research. Based on the results from the semi-structured interview, a process to use the proposed framework in the universities was also developed. It is important for the university management to have a clear commitment and put effort into sustainability, because, without a commitment and effort the true and desired level of sustainability would not be achieved. The prosed process to use the framework developed in this research includes four stages. In the first instance, a university that needs to improve its sustainability must know the level of sustainability considering the factors mentioned in each pillar of sustainability. By knowing the level of each factor, the university will decide either the level is acceptable or not. If the level of a factor is not acceptable, then the university will need to develop and implement a plan to achieve the desired level of that factor. This plan may be short term; medium-term and long term and it may include a variety of initiatives that may lead the sustainability level. The plan duration will depend on the current level and the required level of the different factors. The proposed sustainability framework along with the proposed process was validated by sending it to the heads of fifty top-ranked universities located in the United States, Europe, China, GCC, and India. The feedbacks from these universities were incorporated into the final framework. Longitudinal studies are

recommended to assess the effectiveness of the proposed sustainability framework. Further and continuous research will enable the universities to know and share the effectiveness of different strategies they used to improve the sustainability of different factors. The sustainable educational institutions will effectively play their role to achieve the UN SDGs and pave to the road for the achievement of millennium development goals.

6. References:

Bryman, A., 2016. Social research methods. Oxford university press. Oxford, United Kingdom.

Alghamdi, N. (2017). Knowledge and Awareness of Sustainability in Saudi Arabian Public Universities. Handbook of Sustainability Science and Research, 103–127. http://dx.doi.org/10.1007/978-3-319-63007-6_7.

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(16), pp.1777-1785.

Amaral, L. P., Martins, N., & Gouveia, J. B. (2015). Quest for a sustainable university: a review. International Journal of Sustainability in Higher Education, 16(2), 155–172. https://doi.org/10.1108/ijshe-02-2013-0017.

Amaral, L.P., Martins, N. and Gouveia, J.B., 2015. Quest for a sustainable university: a review. International Journal of Sustainability in Higher Education, 16(2), pp.155-172.

Amutenya, N., Shackleton, C.M. and Whittington-Jones, K., 2009. Paper recycling patterns and potential interventions in the education sector: A case study of paper streams at Rhodes University, South Africa. Resources, Conservation and Recycling, 53(5), pp.237-242. https://doi.org/10.1016/j.resconrec.2008.12.001.

Balzarova, M.A. and Castka, P., 2008. Underlying mechanisms in the maintenance of ISO 14001 environmental management system. Journal of Cleaner Production, 16(18), pp.1949-1957. https://doi.org/10.1016/j.jclepro.2008.01.007.

Balzarova, M.A., Castka, P., Bamber, C.J. and Sharp, J.M., 2006. How organisational culture impacts on the implementation of ISO 14001: 1996–a UK multiple-case view. Journal of Manufacturing Technology Management, 17(1), pp.89-103. https://doi.org/10.1108/17410380610639524.

Berchin, I.I., Sima, M., de Lima, M.A., Biesel, S., dos Santos, L.P., Ferreira, R.V., de Andrade, J.B.S.O. and Ceci, F., 2018. The importance of international conferences on sustainable development as higher education institutions' strategies to promote sustainability: A case study in Brazil. Journal of cleaner production, 171, pp.756-772. https://doi.org/10.1016/j.jclepro.2017.10.042.

Beynaghi, A., Trencher, G., Moztarzadeh, F., Mozafari, M., Maknoon, R. and Leal Filho, W., 2016. Future sustainability scenarios for universities: Moving beyond the United Nations Decade of Education for Sustainable Development. Journal of Cleaner Production, 112, pp.3464-3478. https://doi.org/10.1016/j.jclepro.2015.10.117.

Bhinge, R., Moser, R., Moser, E., Lanza, G. and Dornfeld, D., 2015. Sustainability optimization for global supply chain decision-making. Procedia CIRP, 26, pp.323-328. https://doi.org/10.1016/j.procir.2014.07.105.

Bird, L., Lew, D., Milligan, M., Carlini, E.M., Estanqueiro, A., Flynn, D., Gomez-Lazaro, E., Holttinen, H., Menemenlis, N., Orths, A. and Eriksen, P.B., 2016. Wind and solar energy curtailment: A review of international experience. Renewable and Sustainable Energy Reviews, 65, pp.577-586. https://doi.org/10.1016/j.rser.2016.06.082.

Bryman, A., 2016. Social research methods. Oxford university press. Oxford, United Kingdom.

Burns, E. (2010). Developing Email Interview Practices in Qualitative Research. Sociological Research Online, 15(4), 1–12. https://doi.org/10.5153/sro.2232.

Byrne, J., Taminiau, J., Kurdgelashvili, L. and Kim, K.N., 2015. A review of the solar city concept and methods to assess rooftop solar electric potential, with an illustrative application to the city of Seoul. Renewable and Sustainable Energy Reviews, 41, pp.830-844. https://doi.org/10.1016/j.rser.2014.08.023.

Chen, C.-W. (2018). Incorporating artistic thinking into sustainability. Journal of Cleaner Production, 198, 1007–1012. http://dx.doi.org/10.1016/j.jclepro.2018.07.050.

Chusid, J.M., 2010. Teaching sustainability to preservation students. APT Bulletin: The Journal of Preservation Technology, 41(1), pp.43-49.

Cleveland, R. J., Cohen, H. H., Smith, M. J., & Cohen, A. Safety program practices in record holding plants. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1978.

Cohen, A., Smith, M., and Cohen, H. H. Safety program practices in high vs. low accident rate companies—An interim report (U.S. Department of Health, Education and Welfare Publication No. 75-185). Cincinnati, Ohio: National Institute for Occupational Safety and Health, USA. 1975.

Coleman, K., Murdoch, J., Rayback, S., Seidl, A., & Wallin, K. 2017. Students' Understanding of Sustainability and Climate Change Across Linked Service-Learning Courses. Journal of Geoscience Education, 65(2), 158–167. https://doi.org/10.5408/16-168.1.

Cortese, A.D., 2005. Integrating sustainability in the learning community. Facilities Manager, 21(1), pp.29-34.

Daniel, L., 2015. Safety leadership defined within the Australian construction industry. Construction Economics and Building, 15(4), pp.1-15. https://doi.org/10.5130/ajceb.v15i4.4572.

Darko, A., & Chan, A. P. C. (2016). Critical analysis of green building research trend in construction journals. Habitat International, 57, 53–63. https://doi.org/10.1016/j.habitatint.2016.07.001.

Ebrahimi, K. and North, L.A., 2017. Effective strategies for enhancing waste management at university campuses. International Journal of Sustainability in Higher Education, 18(7), pp.1123-1141. https://doi.org/10.1108/ijshe-01-2016-0017.

Esquer-Peralta, J., Velazquez, L. and Munguia, N., 2008. Perceptions of core elements for sustainability management systems (SMS). Management Decision, 46(7), pp.1027-1038. https://doi.org/10.1108/00251740810890195.

Geng, Y., Liu, K., Xue, B. and Fujita, T., 2013. Creating a “green university” in China: a case of Shenyang University. Journal of Cleaner Production, 61, pp.13-19. https://doi.org/10.1016/j.jclepro.2012.07.013.

Gillingham, K., Rapson, D. and Wagner, G., 2016. The rebound effect and energy efficiency policy. Review of Environmental Economics and Policy, 10(1), pp.68-88. https://doi.org/10.1093/reep/rev017.

Graneheim UH and Lundman B (2004) ‘’Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness’’. Nurse Education Today Feb 2004; 24(2): 105-12. http://dx.doi.org/10.1016/j.nedt.2003.10.001.

Harrison, J., & Palmer, T. 2019. Interprofessional Study Abroad: Enhancing Social Justice and Sustainability through Shared Experiential Learning. Journal of Teaching in International Business, 30(2), 125–146. https://doi.org/10.1080/08975930.2019.1663774.

ISO 14001:1996. International Organization for Standardization. Environmental management systems -- Specification with guidance for use. 1996. ISO, Geneva, Switzerland. See: https://www.iso.org/standard/23142.html (assessed 14/03/2018).

Kibert, C.J., 2016. Sustainable construction: green building design and delivery. John Wiley & Sons. New Jersey, United States.

Krueger, R. and Gibbs, D. eds., 2007. The sustainable development paradox: Urban political economy in the United States and Europe. Guilford Press, New York, New York, United States.

Leal Filho, W., Brandli, L.L., Becker, D., Skanavis, C., Kounani, A., Sardi, C., Papaioannidou, D., Paço, A., Azeiteiro, U., de Sousa, L.O. and Raath, S., 2018. Sustainable development policies as indicators and pre-conditions for sustainability efforts at universities: Fact or fiction?. International Journal of Sustainability in Higher Education, 19(1), pp.85-113.

Long, J. 2014. Constructing the narrative of the sustainability fix: Sustainability, social justice and representation in Austin, TX. Urban Studies, 53(1), 149–172. https://doi.org/10.1177/0042098014560501.

Lozano, R., (2011) "The state of sustainability reporting in universities", International Journal of Sustainability in Higher Education, Vol. 12 Issue: 1, pp.67-78, https://doi.org/10.1108/14676371111098311.

Lozano, R., Ceulemans, K., Alonso-Almeida, M., Huisingh, D., Lozano, F.J., Waas, T., Lambrechts, W., Lukman, R. and Hugé, J., 2015. A review of commitment and implementation of sustainable development in higher education: results from a worldwide survey. Journal of Cleaner Production, 108, pp.1-18. https://doi.org/10.1016/j.jclepro.2014.09.048.

Lu, Y., Nakicenovic, N., Visbeck, M. and Stevance, A.S., 2015. Policy: Five priorities for the UN sustainable development goals. Nature News, 520(7548), p.432. 432–433. https://doi.org/10.1038/520432a.

Luo, J., Chau, K., Lam, C., Huang, G. and Kou, I., 2018. Attitudes of undergraduate students from university–industry partnership for sustainable development: A case study in Macau. Sustainability, 10(5), p.1378. http://dx.doi.org/10.3390/su10051378.

Martins V.W.B., Anholon R., Quelhas O.L.G. (2019) Sustainable Transportation Methods. In: Leal Filho W. (eds) Encyclopedia of Sustainability in Higher Education. Springer, Cham. https://doi.org/10.1007/978-3-319-63951-2.

Mason, M., 2010, August. Sample size and saturation in PhD studies using qualitative interviews. In Forum qualitative Sozialforschung/Forum: qualitative social research (Vol. 11, No. 3).pp 1 – 19. ISSN 1438-5627.

McCright, A., O'Shea, B., Sweeder, R., Urquhart, G., and Zeleke, A. 2013. Promoting interdisciplinarity through climate change education. Nature Climate Change, 3:713–716. https://doi.org/10.1038/nclimate1844.

McIntosh, M.J. and Morse, J.M., 2015. Situating and constructing diversity in semi-structured interviews. Global qualitative nursing research, 2, p.2333393615597674. http://dx.doi.org/10.1177/2333393615597674.

Meho, L. I. (2006). E-mail interviewing in qualitative research: A methodological discussion. Journal of the American Society for Information Science and Technology, 57(10), 1284-1295. https://doi.org/10.1002/asi.20416.

Michalek, I.M., Loring, B. and John, S.M., 2017. A systematic review of worldwide epidemiology of psoriasis. Journal of the European Academy of Dermatology and Venereology, 31(2), pp.205-212. https://doi.org/10.1111/jdv.13854.

Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine. 2009 Aug 18;151(4):264-269. https://doi.org/10.7326/0003-4819-151-4-200908180-00135.

Morrow, D. and Rondinelli, D., 2002. Adopting corporate environmental management systems:: Motivations and results of ISO 14001 and EMAS certification. European management journal, 20(2), pp.159-171. https://doi.org/10.1016/s0263-2373(02)00026-9.

Mtutu, P. and Thondhlana, G., 2016. Encouraging pro-environmental behaviour: Energy use and recycling at Rhodes University, South Africa. Habitat International, 53, pp.142-150. https://doi.org/10.1016/j.habitatint.2015.11.031.

Newman, L., 2006. Change, uncertainty, and futures of sustainable development. Futures, 38(5), pp.633-637.

Nolet, V. 2016. Educating for sustainability: Principles and practices for teachers. Routledge, New York, United States.

Olawumi, T. O., & Chan, D. W. M. 2018. A scientometric review of global research on sustainability and sustainable development. Journal of Cleaner Production, 183, 231–250. https://doi.org/10.1016/j.jclepro.2018.02.162.

Opdenakker, R., 2006, September. Advantages and disadvantages of four interview techniques in qualitative research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 7, No. 4). Pp. 1 – 13. ISSN 1438-5627.

Pattberg, P. and Widerberg, O., 2016. Transnational multistakeholder partnerships for sustainable development: Conditions for success. Ambio, 45(1), pp.42-51. https://doi.org/10.1007/s13280-015-0684-2.

Pritoni, M., Salmon, K., Sanguinetti, A., Morejohn, J., & Modera, M. (2017). Occupant thermal feedback for improved efficiency in university buildings. Energy and Buildings, 144, 241–250. https://doi.org/10.1016/j.enbuild.2017.03.048.

Ralph, M., & Stubbs, W. (2013). Integrating environmental sustainability into universities. Higher Education, 67(1), 71–90. https://doi.org/10.1007/s10734-013-9641-9.

Reid, A., & Petocz, P. (2006). University Lecturers' Understanding of Sustainability. Higher Education, 51(1), 105–123. https://doi.org/10.1007/s10734-004-6379-4.

Richardson, G. R. A., & Lynes, J. K. (2007). Institutional motivations and barriers to the construction of green buildings on campus. International Journal of Sustainability in Higher Education, 8(3), 339–354. https://doi.org/10.1108/14676370710817183.

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G. 2019. Sustainable Development Report 2019. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). New York, United States. See: https://s3.amazonaws.com/sustainabledevelopment.report/2019/2019_sustainable_development_report.pdf (accessed 15/12/2019).

Savely, S.M., Carson, A.I. and Delclos, G.L., 2007. An environmental management system implementation model for US colleges and universities. Journal of Cleaner Production, 15(7), pp.660-670. https://doi.org/10.1016/j.jclepro.2006.01.013.

Shafai-Sahrai, Y. An inquiry into factors that might explain differences in occupational accident experience of similar size firms in the same industry (Tech. rep.). East Lansing, Mich.: Division of Research, Graduate School of Business Administration, Michigan State University Press, Michigan, USA. 1971.

Shi, H., & Lai, E. 2013. An alternative university sustainability rating framework with a structured criteria tree. Journal of Cleaner Production, 61, 59–69. https://doi.org/10.1016/j.jclepro.2013.09.006.

Shih, T.-H., & Xitao Fan. (2008). Comparing Response Rates from Web and Mail Surveys: A Meta-Analysis. Field Methods, 20(3), 249–271. https://doi.org/10.1177/1525822x08317085.

Simkins, G. and Nolan, A., 2004. Environmental management systems in universities. Occasional paper for the environmental association for universities and colleges. EAUC, Gloucestershire, UK.

Smyth, D.P., Fredeen, A.L. and Booth, A.L., 2010. Reducing solid waste in higher education: The first step towards 'greening'a university campus. Resources, Conservation and Recycling, 54(11), pp.1007-1016. https://doi.org/10.1016/j.resconrec.2010.02.008.

Soini, K., Jurgilevich, A., Pietikäinen, J. and Korhonen-Kurki, K., 2018. Universities responding to the call for sustainability: A typology of sustainability centres. Journal of Cleaner Production, 170, pp.1423-1432.`

Sonetti, G., Lombardi, P. and Chelleri, L., 2016. True green and sustainable university campuses? Toward a clusters approach. Sustainability, 8(1), p.83 (1-23). https://doi.org/10.3390/su8010083.

Song, K., Kim, S., Park, M., & Lee, H.-S. (2017). Energy efficiency-based course timetabling for university buildings. Energy, 139, 394–405. https://doi.org/10.1016/j.energy.2017.07.176.

Stafford, S. L. (2010). HOW GREEN IS YOUR CAMPUS? AN ANALYSIS OF THE FACTORS THAT DRIVE UNIVERSITIES TO EMBRACE SUSTAINABILITY. Contemporary Economic Policy, 29(3), 337–356. https://doi.org/10.1111/j.1465-7287.2010.00231.x.

Tebbutt, E., Brodmann, R., Borg, J., MacLachlan, M., Khasnabis, C. and Horvath, R., 2016. Assistive products and the sustainable development goals (SDGs). Globalization and health, 12(1), p.79. https://doi.org/10.1186/s12992-016-0220-6.

Too, L. and Bajracharya, B., 2015. Sustainable campus: engaging the community in sustainability. International Journal of Sustainability in Higher Education, 16(1), pp.57-71. http://dx.doi.org/10.1108/IJSHE-07-2013-0080.

Umar T, Wamuziri S and Egbu C, 2017. Factors that influence safety climate in construction in Oman. In Proceedings of Joint CIB W099 and TG59 International Safety, Health, and People in Construction Conference, Cape Town, South Africa (Emuze F and Behm M (eds)). pp. 99–113, ISBN: 978-1-920508-78-4.

Umar, T. and Egbu, C., 2018-a. Global Commitment Towards Sustainable Energy. In Proceedings of the Institution of Civil Engineers-Engineering Sustainability (pp. 1-38). Thomas Telford Ltd. https://doi.org/10.1680/jensu.17.00059.

Umar, T. and Egbu, C., 2018-b. Perceptions on safety climate: a case study in the Omani construction industry. Proceedings of the Institution of Civil Engineers-Management, Procurement and Law, 171(6), pp.251-263. https://doi.org/10.1680/jmapl.18.00001.

Umar, T. and Egbu, C., 2020. Heat stress, a hidden cause of accidents in construction. Proceedings of the Institution of Civil Engineers–Municipal Engineer (Vol. 173, No. 1, pp. 49-60). Thomas Telford Ltd. https://doi.org/10.1680/jmuen.18.00004.

Umar, T. and Wamuziri, S., 2016. Briefing: Conventional, wind and solar energy resources in Oman. Proceedings of the Institution of Civil Engineers-Energy, 169(4), pp.143-147. https://doi.org/10.1680/jener.16.00011.

Umar, T. and Wamuziri, S., 2017. Briefing: Using 'safety climate factors' to improve construction safety. Proceedings of the Institution of Civil Engineers-Municipal Engineer (Vol. 170, No. 2, pp. 65-67). Thomas Telford Ltd. https://doi.org/10.1680/jmuen.16.00020.

Umar, T., 2017-a. Rooftop solar photovoltaic energy: a case study of India. Nanomaterials and Energy, 6(1), pp.17-22. https://doi.org/10.1680/jnaen.16.00002.

Umar, T., 2017-b. Briefing: Defining safety leadership in construction. Proceedings of the Institution of Civil Engineers-Municipal Engineer (Vol. 170, No. 1, pp. 3-5). Thomas Telford Ltd. https://doi.org/10.1680/jmuen.16.00004.

Umar, T., 2018-a. Towards a sustainable energy: the potential of biomass for electricity generation in Oman. Proceedings of the Institution of Civil Engineers: Engineering Sustainability. 171(7), pp, 329-333. https://doi.org/10.1680/jensu.17.00001.

Umar, T., 2018-b. Geothermal energy resources in Oman. Proceedings of the Institution of Civil Engineers-Energy, 171(1), pp.37-43. https://doi.org/10.1680/jener.17.00001.

Umar, T., Egbu, C., Ofori, G., Honnurvali, M.S., Saidani, M. and Opoku, A., 2019. Challenges towards renewable energy: an exploratory study from the Arabian Gulf region. Proceedings of the Institution of Civil Engineers-Energy, pp.1-13. https://doi.org/10.1680/jener.19.00034.

Umar, T., Egbu, C., Ofori, G., Honnurvali, M.S., Saidani, M., Shibani, A., Opoku, A., Gupta, N. and Goh, K., 2020, February. UAE's Commitment Towards UN Sustainable Development Goals. Proceedings of the Institution of Civil Engineers-Engineering Sustainability (pp. 1-18). Thomas Telford Ltd. https://doi.org/10.1680/jensu.19.00036.

UN SDGs, 2017. (United Nation Sustainable Development Goals, 2017). Transforming our world: the 2030 Agenda for Sustainable Development. United Nation, New York, USA. See: http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E (accessed 24/09/2017).

UNESCO, 1972. (United Nations Educational, Scientific and Cultural Organization), Stockholm Declaration of 1972. UNESCO. France, Paris. See: http://unesdoc.unesco.org/images/0000/000044/004437EB.pdf (assessed 14/03/2018).

UNMGs, (United Nations Millennium Goals), 2019. United Nations Millennium Goals, United Nations, New York, United States. See: https://www.un.org/millenniumgoals/ (accessed 15/12/2019).

Velazquez, L., Munguia, N., Platt, A. and Taddei, J., 2006. Sustainable university: what can be the matter?. Journal of Cleaner Production, 14(9-11), pp.810-819.

Wang, X., Chen, Y., Liu, Y., Yao, L., Estill, J., Bian, Z., Wu, T., Shang, H., Lee, M.S., Wei, D. and Tian, J., 2019. Reporting items for systematic reviews and meta-analyses of acupuncture: the PRISMA for acupuncture checklist. BMC complementary and alternative medicine, 19(1), p.208. https://doi.org/10.1186/s12906-019-2624-3.

Welch, V., Petticrew, M., Petkovic, J., Moher, D., Waters, E., White, H., Tugwell, P. and PRISMA-Equity Bellagio group, 2016. Extending the PRISMA statement to equity-focused systematic reviews (PRISMA-E 2012): explanation and elaboration. Journal of Development Effectiveness, 8(2), pp.287-324. https://doi.org/10.1001/jama.2015.3656.

Wooltorton, S., Wilkinson, A., Horwitz, P., Bahn, S., Redmond, J., & Dooley, J. (2015). Sustainability and action research in universities. International Journal of Sustainability in Higher Education, 16(4), 424–439. https://doi.org/10.1108/ijshe-09-2013-0111.

Yáñez, S., Uruburu, Á., Moreno, A. and Lumbreras, J., 2019. The Sustainability Report as an essential tool for the holistic and strategic vision of Higher Education Institutions. Journal of Cleaner Production, 207, pp.57-66.

Yi, W. and Chan, A., 2016. Health profile of construction workers in Hong Kong. International journal of environmental research and public health, 13(12), p.1232. https://doi.org/10.3390/ijerph13121232.

Young, R.A., 2012. Stewardship of the built environment: Sustainability, preservation, and reuse. Island Press. Island Press/Center for Resource Economics, Washington, DC, Washington, USA. http://dx.doi.org/10.5822/978-1-61091-236-5.

Zhan, Z., Fong, P., Mei, H., Chang, X., Liang, T. and Ma, Z., 2015. Sustainability education in massive open online courses: A content analysis approach. Sustainability, 7(3), pp.2274-2300. https://doi.org/10.3390/su7032274.

Zohar, D., 1980. Safety climate in industrial organizations: theoretical and applied implications. Journal of applied psychology, 65(1), p.96. http://psycnet.apa.org/doi/10.1037/0021-9010.65.1.96.