

# An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices

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Received 8 October 2007; received in revised form 3 December 2007; accepted 4 December 2007

Available online 15 January 2008

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## Abstract

Universities can nowadays be regarded as ‘small cities’ due to their large size, population, and the various complex activities taking place in campuses, which have some serious direct and indirect impacts on the environment. The environmental pollution and degradation caused by universities in form of energy and material consumption via activities and operations in teaching and research, provision of support services and in residential areas could be considerably reduced by an effective choice of organizational and technical measures. Although many environmental protection measures can be seen at some universities, but a more systematic and sustainable approach to reducing the negative impacts of those activities and making the campuses more sustainable, is generally lacking. Therefore, this paper proposes a framework of a more suitable approach to achieving campus sustainability that could remedy the limitations of the current environmental management practices in universities and ensures 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.

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**Keywords:** Campus sustainability; EMS; Green campus; Public participation; Social responsibility

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## 1. Introduction

Campus sustainability has become an issue of global concern for university policy makers and planners as result of the realization of the impacts the activities and operations of universities have on the environment. The issue has also been intensified by the pressure from government environmental protection agencies, sustainability movements, university stakeholders as well as the momentum of other forces including student activism and NGOs. For example, in 2000 the US Environmental Protection Agency issued an enforcement alert which explained that the agency was now holding colleges and universities to the same standards as industry with regards to the issues of human health and environment [19]. Some universities have also voluntarily signed some declarations to

indicate their commitments to sustainability and the number of those universities is increasing [38].

The Stockholm Declaration of 1972 was the first to make reference to sustainability in higher education and has recognized the interdependency between the humanity and the environment and suggests several ways of achieving environmental sustainability [37]. In 1990, over 300 university administrators in over 40 countries have signed the Talloires Declaration – a 10-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities [32]. One year later, at Halifax (Canada), university administrators again added their voice on the continuing widespread degradation of the earth’s environment, and the pervasive influence of poverty on the process [33]. During the Swansea Declaration of 1993, participants drawn from over 400 universities in 47 different countries focused on finding ways by which the universities of the Association of Commonwealth Universities,

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their leaders, scholars and students might engage and deploy their resources to respond appropriately to the challenge of finding the balance between human quest for economic and technological development and environmental preservation [34]. As a result of the mentioned pressure on the universities, signed commitments and voluntary decisions, several universities have embarked on projects and initiatives to incorporate sustainability into their systems.

These initiatives are based on the university environmental goals and targets and university management's concept of sustainability because the concept presents diverging interpretations according to the actors that are implied [41]. To some universities, a sustainable university is just having a master plan, environmental plan, environmental guidelines or environmental statement [24]. While some believe that they have met the challenge of sustainability through the signing of national or international declarations [38], others create individual institutional policies and employ either ISO 14001, green building initiative, EMAS, environmental stewardship, EIA of projects, or environmental protection, etc., as a means of achieving campus sustainability. The planning and implementation of the sustainability initiatives are also carried out by scientists and professionals with diverse background and varying notions of sustainability.

However, the traditional practices and regulations of addressing environmental issues – in a reactive [42], project and ad hoc manner – have become highly inefficient and cannot guarantee sustainability. Further, these environmental protection regulations largely focus on control of water and air emissions and waste disposal [14]. Environmental issues are becoming more complex [41], multidimensional and interconnected and environmental sustainability by its very nature requires an integrated and systematic approach to decisions making, investments and management. Therefore, there is need for a professional and systematic environmental management approach to reducing the consumption of resources and negative impacts of the various campus operations and promoting campus sustainability. Unfortunately, this approach is generally lacking in most universities, and achieving sustainability is not easy [6].

Therefore, this paper proposes a more suitable integrated approach to achieving campus sustainability that could remedy the limitations of the current environmental management practices in universities and ensures more sustainability through the integration of three strategies, namely: university EMS; public participation and social responsibility; and promoting sustainability in teaching and research. The paper shades more light on the concept of sustainability and why university campuses need to be sustainable in Section 2. Then the widely used practices for achieving campus environmental sustainability are highlighted in Section 3. The framework of the integrated approach, its strategies and advantages in promoting campus sustainability are then discussed in Section 4. In Section 5, the paper presents some considerations for university administrators, urban planners and policy makers in promoting campus sustainability and some conclusions are finally drawn in Section 6.

## 2. The need for sustainability in universities

A sustainable university is defined by Velazquez et al. [24, p. 812] 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”.

Cole [4, p. 30] also defines a sustainable campus community as “the one that acts upon its local and global responsibilities to protect and enhance the health and well-being of humans and ecosystems. It actively engages the knowledge of the university community to address the ecological and social challenges that we face now and in the future”. Sustainability assurance means that the full costs of development proposals are identified, mitigated, compensated or offset [16]. We are of the opinion that a sustainable university campus should be a healthy campus environment, with a prosperous economy through energy and resource conservation, waste reduction and an efficient environmental management, and promotes equity and social justice in its affairs and export these values at community, national and global levels.

There is a common understanding in the literature that a sustainable university campus 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 [15]. Sustainability is characterized by economic growth based on social justness and efficiency in the use of natural resources [11,28,30], and it includes the recognition that all stakeholders' co-operation and participation are required to effectively achieve sustainability goals. For a city or an organization to be sustainable, it requires conservation and enhancement of its resources base, an elimination of poverty and deprivation of its inhabitants, broadening of the concept of development so that it covers not only economic growth but also social and cultural development [17]. Elizabete et al. [6] have also identified five essential dimensions within the concept of sustainability, namely: ecological, social, economic, cultural and spatial. Sustainability affects every sphere of a university, from the classrooms and laboratories, to housing, transportation and other services, and to the entire campus.

The need for environmental sustainability in university campuses has been stressed in many articles [2,3,5,25,39,40]. Universities also have several activities and complex operations with potentially significant environmental impacts that, until recently, have been largely overlooked in terms of social and environmental responsibility. Many university-related activities and operations require monitoring for significant environmental impacts. These include workshops and laboratory use, buildings and grounds maintenance as well as energy and materials use. Universities can be compared to complex buildings like hospitals and mega hotels in terms of waste generation, water and materials intake, as well as electricity and hydrocarbon fuels consumption in operating machineries, heating and

lighting, transportation etc. each with implications for environmental quality.

Bernheim [3] asserts that academic institutions are an integral part of the automobile-intensive, high-consumption, waste-intensive global landscape. The intensified and unsustainable demand for land, water, and other resources resulting from the rapid growth of university population and the expansion of campus lead to increased degradation of its natural ecosystems and erode the life supporting systems that uphold human civilization. Caring for natural resources and promoting their sustainable use is an essential response of the world community to ensure its own survival and well-being because environmental resources sustainability is a necessary foundation for sustainable development.

Environmental degradation does not only occur in lecture halls and research laboratories, but also in the living and administration areas and could be effectively reduced considerably by adoption and implementing a systematic organizational and technical measure [12]. However, with such large scale and range of potential impacts, the heterogeneous nature of university campuses, different land uses and activities on campus and the fact that universities have some social responsibilities of training and educating the society, environmental management and sustainability at colleges and universities requires a holistic approach similar to that of towns.

Universities also make a significant contribution to the development of our society, and, therefore, have a special societal responsibility, in particular with regard to youth training and public awareness about sustainability [25]. Therefore, universities should promote a pattern of development that would be compatible with a safe environment, biodiversity, ecological balance, and intergenerational equity. As sustainability concept is applied to universities, it should serve as a means of configuring the campus and its various activities so that the university, its members and its economies are able to meet their needs and express their greatest potential in the present and planning and acting for the ability to maintain these ideals in a very long-term.

### 3. The existing sustainability practices in universities

The higher education sector has discovered that its activities and physical structures can have significant impacts on the environment and have started devising ways to organize the activities and to recognize and reduce their adverse effects on the environment [9]. Over the past decade, many universities have taken a more responsible approach to managing their environmental performance and improvement. This is not isolated to a single country or region, but has been particularly prominent in Europe, USA, Canada as well as in Australia, Asia, South America and Africa [20]. The three widely used approaches — green building initiative, ISO 14001 and EMAS — would be highlighted in this section.

Some universities are calling for the need to “green” the campus, but there are several interpretations of the green agenda — some use the terms green campus, eco-urbanism, green urbanism, green building, high performance buildings,

etc. to describe the concept. The ways the initiative is implemented also varies from one university to another. The green buildings initiative is a set of projects designed to decrease production of waste and hazardous materials, reduce level of energy consumption and promote the design of energy-efficient buildings. This initiative is gaining momentum and universities and colleges globally are nowadays using it to promote campus sustainability.

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 [5]. One of the main goals of this initiative is to promote the construction of energy and resource efficient buildings. This goal is achievable by a choice of environmentally friendly building materials and design of integrated and flexible systems in buildings, which can impact indoor air quality and are also energy-efficient. The green building concept also promotes the use of local materials, which can help regional economies and reduce transportation costs in terms of money and pollution as well as the adoption of safer construction practice that includes mitigating the impacts of construction storm water run-off, noise, dust, personnel, and traffic.

The green building initiative offers many advantages over traditional building design concepts but cannot alone guarantee sustainability as it lacks a systematic and continuous campus quality improvement. The initiative’s other shortcomings are its lack of policy approach to environmental sustainability and measurement of progress as is the case with EMS. According to US Green Building Council [23], even though implementing green building strategies — through conservation of resources, energy efficiency, and increased reliance on renewable energy sources — can be described as a big step towards campus sustainability, it cannot solely ensure campus sustainability. University of Buffalo green office [22], on their website, has this to say about their green campus projects “... We have started on this critically important endeavor — though we have a long way to go before we achieve anything approaching genuine environmental sustainability”. As it can be observed, sustainability is a complicated concept, and its implementation in universities faces immense hurdles that need a systematic approach to overcome. Even more challenging, much of university campuses’ structures and infrastructure have already been built unsustainably and sustainability by its very nature requires an integrated and holistic approach to decisions making and investments.

Another practice widely employed by universities in achieving sustainability is the ISO 14001 standard [27], which has been implemented by a large number of universities in USA and Europe. The standard is known corporatwide with the purpose of prescribing and implementing environmental goals, policies, and responsibilities, as well as regular auditing of its elements [21]. ISO 14001 guides organizations in managing the impact their products, services, and operations have on the environment and for external certification and it is

becoming one of the dominant international standards for assessing environmental management processes [14]. The ISO 14000 comprises of two main parts: specification with guidance for use and general guidelines or principles, systems and supporting techniques. Simkins and Nolan [20] indicate that the standards have the objectives such as to:

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

Though ISO 14001 can make these meaningful contributions in promoting campus sustainability, but the standard is without weaknesses. Some of the identified limitations are its lack of social dimension [21] and that it focuses primarily on the environmental dimensions, giving little or no consideration to economic or social issues [11, p. 965] and that it does not speak of strategic planning for sustainability, or provides upstream solutions of problems at their source [29]. Another setback of the ISO 14001 standard is that it is generic and does not prescribe specific environmental performance policies, objectives or targets, which have to be defined internally

by the organization and that bring about several varying practices of environmental management and lack of standard approach to sustainability by universities. It is also argued that the standard is meant mainly for industries and has, therefore, places less emphasis on public participation [1]. According to Savely et al. [19], there are only two EMS models that have been proposed specifically for colleges and universities – the Osnabruck model and the university of South Carolina sustainability initiative.

Developed in 1993, European Eco-Management and Audit Scheme (EMAS), on the other hand, is designed to bring about changes in environmental performance [14]. But the rate of adoption of EMAS appears to be declining among companies and institutions. Being more demanding, especially with the verified environmental declaration, the external benefits on which EMAS was ‘sold’ to companies by politicians, consultants and industry associations alike, have not materialized. This has lead to considerable frustration and less interest in the environmental declaration except academics and consultants. Not only were the responses from customers and the public lukewarm at best, but also investors, banks, insurance companies, etc. didn’t even care. Especially disappointing was that the local environmental enforcement agencies didn’t even know how to deal with EMAS [21].

Adopting any of the above management alone will not ensure sustainability as several weaknesses have been pointed out in the previous section. To acknowledge the different dimensions and complexity of environmental problems require a more proactive attitude and the development of integrated solutions [8]. Therefore, this paper calls for the adoption of the proposed approach in Fig. 1 that would look into all sustainability issues in a systematic and integrated way and take care of the observed limitations.

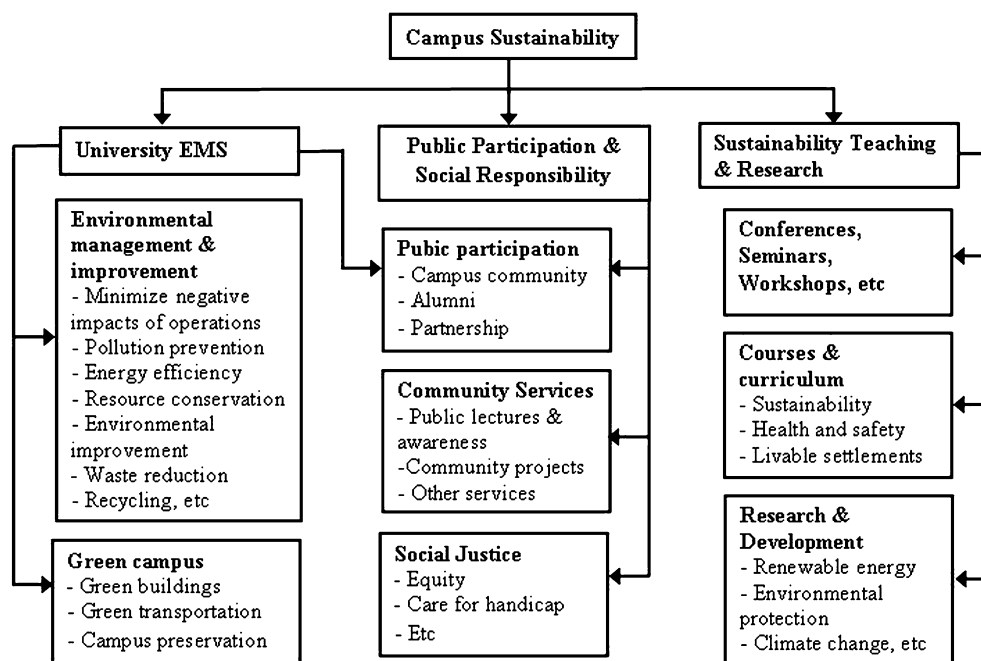


Fig. 1. Framework of the proposed approach to achieving campus sustainability.



#### 4. An integrated approach for achieving campus sustainability

A university that is going to promote sustainability on its campus should have a clear vision and the commitment of management to sustainability. The university should also establish an organizational structure, through either a department or a committee, and provides the necessary resources required to achieve the sustainability vision. When these are available, implementing a sustainability approach like this becomes easier. This approach to achieving more sustainability on university campuses recommends adopting three strategies, namely: EMS implementation; public participation and social responsibility; and sustainability teaching and research in an integrated way. Each strategy has some initiatives that could lead to achieving the sustainability mission of a university as can be seen in the framework in Fig. 1.

##### 4.1. University EMS implementation

An EMS constitutes the set of overall practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining university policy of achieving sustainable environment. It is an approach to dealing with environmental problems that give responsibility to a university to implement environmental practices and regulations to ensure that environmental issues are managed consistently and systematically throughout the university to enable it reduce its environmental impacts and increase its operating efficiency.

The adoption of an EMS that integrates university environmental protection programs and improves sustainability is advocated by many environmental experts around the world. According to Barnes and Jerman [2], EMS can be a successful tool for educational institutions to effectively manage diverse environmental concerns and improve campus sustainability. Implementing EMS provides an effective guidance for organizations like universities to simultaneously establish, develop and review their operations and practices in more environmentally and socially responsible ways [16]. EMS implementation and certification do help universities to integrate their environmental, health and safety management systems and in some cases their quality management systems. Its implementation affects everyone directly or indirectly by virtue of its general goals, such as continual environmental improvement, increased recycling, and waste reduction [14].

This EMS could also provide a harmonized standard for identifying prioritizing and managing university's environmental aspects and impacts and implementing it would not only focus university's attention on negative environmental impacts but also ensures that responsibility is appropriately assigned for maintaining high environmental standards throughout the campus. Public participation is also an important component of the university EMS. This EMS includes defining specific environmental indicators that can be tracked and regularly assessed to determine whether operations change to become more environmentally friendly. The university EMS in the proposed approach would promote sustainability through the following ways.

##### 4.1.1. Environmental management and improvement

As a structured framework for the assessment and management of an organization's environmental impacts and for the incremental improvement of environmental performance, this university EMS incorporates the organizational structure, procedures, and resources for environmental management, and can be readily compared to quality management systems, from which they ultimately derive [20]. One of its most significant merits is in improving the environmental awareness of university managers and workers, and in clarifying everyone's responsibility for environmental improvements [13]. It is implemented via an iterative and continuous process where environmental sustainability practices will be continually improved and evaluated by regular environmental audits and can improve environmental performance by adequate environmental documentation and correcting fundamental flaws in the environmental management process [18].

This university EMS can also bring a process of change in universities in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. It will foster a sustainable university campus by promoting:

- A healthy campus environment through minimizing the negative impact of campus activities and operations on human health and elimination of toxic substances, and reduction of waste, effluent generation, and emissions to the environment.
- A prosperous university economy through energy and resource conservation, use of renewable raw materials, and efficient environmental management.
- A fair learning environment that improves the general well-being of the present and future university community and gives equal opportunities to all in the areas of teaching and research and participation in campus development and sustainability.

##### 4.1.2. Green campus

This green campus initiative calls for the university EMS to promote construction of green buildings and transportation facilities such as footpaths, cycle-ways, greenways, etc. on the campus. Green buildings can reduce energy consumption and improve the well-being of the university community. The target of the energy-efficient green buildings is to have better lighting, temperature control, improved ventilation and indoor air quality which contribute to healthy environments by reducing the dangerous air-pollutants that cause respiratory disease in campus buildings. A building's energy use is a primary consideration in its long-term environmental impact because both the heating and cooling design and the equipment selected contribute to this impact. Energy efficiency improves as building spaces are used efficiently with intelligent control systems.

The importance of energy efficiency of buildings and control of the indoor air quality has been strongly emphasized at an international congress of building technology (CLIMA2007-

Wellbeing Indoors) in Helsinki, Finland [43]. The Austrian and Japanese study presented in the congress suggests that by adjusting the heating/cooling and lighting systems so that the purpose of the building is taken into consideration energy savings up to 30–70% can be achieved. The congress covered all the aspects of HVAC technology including building automation and water conservation. Energy efficiency and conservation could be achieved through the following ways.

- Use more efficient HVAC systems with improved building control systems using the wide range of viable passive energy technologies and integrating them into overall design for maximum effect.
- Use of wind, solar and geothermal sources for heat and power, low-flow faucets, showerheads, and toilets and day lighting to illuminate classrooms which offers dramatic reductions in buildings operations and maintenance costs.
- Reduce energy costs by installing centralized control systems to control off-hour heating, cooling, and lighting across the campus.
- Reduce lighting loads and improve comfort by incorporating energy-efficient lighting such as T-8, compact fluorescents, and metal halide fixtures.

Aside energy efficiency and conservation, this initiative also promote resource conservation, recycling and management. Water conservation can be achieved via the collection of rainwater and storm water for irrigation use and design landscapes with drought-resistant, native plants and grasses, and that support integrated pest management. Recycling systems that encourage contractors to recycle in constructing buildings and facilitate staff and student recycling helps conserve resources. Through campus greening, it is estimated to create more new jobs each year from increased use of energy efficiency technologies and produce buildings that can be easily reconfigured and reused.

Green transportation system through encouraging the use of bicycles within campuses and providing access to public transportation to all staff, students and visitors and discouraging single-car employee commuting can also reduce emission and congestion. Preservation of green spaces, historic sites and landforms of visual importance such as rivers, mountains, green space, etc., is another element of this initiative. To ensure this continued campus preservation, long-term campus planning calls for careful limitations on expanding development.

#### 4.2. Public participation and social responsibility

'This strategy seeks university stakeholders' participation in achieving sustainability and university social responsibility of promoting environmental justice and equity to all irrespective of race and gender and the need to care for the handicap and people of special needs. Becoming a sustainable university also requires partnership with private, governmental and non-governmental organizations (NGOs) as shown in the following initiatives among others.

##### 4.2.1. Public participation and partnership

This initiative involves partnership with governmental agencies, other institutions, private sector and NGOs in fostering campus sustainability. Private sector and government agencies can partner with universities in research and development, while NGOs can work with universities in organizing workshops and conferences on sustainability. This partnership can be done at local, national or international levels. The initiative also incorporates involvement of interested and affected university community throughout the policy decision-making process, and in planning and implementation of campus sustainability practices. The participation of the university community could be accomplished through organizing focus group discussions, interview with some stakeholders' representatives to get their input into the process. Effective participation should include the formation of advisory panel of selected community representatives to be involved in the overall campus sustainability process. This initiative can assist university in moving on a performance continuum from regulatory compliance to environmental stewardship and sustainability through the use of systems thinking and input from key stakeholders.

The participation includes the promise that the public's contribution will influence the decision affecting them [31]. The process communicates the interests and meets the process needs of all participants and provides them with the information they need to participate in a meaningful way, and how their input affects the decision. There has been a lot of emphasis on the importance of co-operation and integration of stakeholders for environmental sustainability [7]. Therefore, this initiative gives the university community more say in decisions about actions that affect their lives.

##### 4.2.2. Community services

Another social responsibility of university campuses in promoting sustainability is offering community projects and awareness services. The manner in which university carries out its daily activities is an important demonstration of ways to achieve environmentally responsible living and to reinforce desired values and behaviors in the whole community. Universities should work with the local community to capture the environmental importance of the campus and make it function as a center of the community. This initiative can demonstrate to parents and the general community the practical ways that we can turn back the clock on global warming while creating healthier, more efficient, and less costly learning environments. The initiative can also import.

##### 4.2.3. Social justice

Refers to the concept of a society in which justice is achieved in every aspect of society, rather than merely the administration of law, a society which affords individuals and groups fair treatment and a just share of the benefits of society. Universities should promote the importance of human dignity, equality, peace and justice, genuine security, human and civil rights, health and safety concerns in sustainability. There is a growing understanding of the multiple benefits of valuing social capital,

for both moral and economic reasons, and including them in measures of national well-being. Social justice also involves the introduction of new ideas, technologies and skills requires by local communities and an understanding of local decision-making systems, gender divisions and cultural preferences.

This initiative could also be in the form of promoting gender and racial equality in admission and provision of academic and support services and in providing special care and assistance to the handicap and people with special needs in the provision of facilities in teaching and research, dining, accommodation, parking spaces, walkways and restrooms.

#### 4.3. Sustainability teaching and research

Universities are unique places that serve multiple missions, including education, research and public services and, therefore, have some social responsibilities of educating students, and the society about sustainability. This could be achieved through incorporating sustainability into the following.

##### 4.3.1. Conferences, seminars and workshops

Conferences, seminars and workshops could encourage research, provide avenue for international organizations, industry and academia to discuss and study environmental issues and their relationships to other socio-economic issues and foster an understanding and responsibility for the sustainability of the environment. Coming together of experts and decision makers, through conferences and seminars, provide a forum for discussing important issues like good governance, global warming, poverty, conflicts and refugees, housing problems, gender inequality, child and maternal diseases, etc., and propose possible ways of tackling them. This would ensure that individuals in university campuses and outside are knowledgeable about these issues that affect their life and share their opinions on the best ways of addressing them.

##### 4.3.2. Sustainability in courses and curriculum

Universities prepare most of the professional that develop, teach, work in, manage, lead and influence society's institutions. Future leaders, entrepreneurs and decision makers are also educated and prepared by universities. Therefore, a university is an effective avenue for communicating the value of environmental sustainability to a wide variety of audience. Thus, this initiative calls on universities to take the responsibility of promoting sustainability by making sustainability a teaching tool and to send the message that it matters. This is achieved by infusing sustainability into graduate and undergraduate courses and curriculum for fields of the built environment, humanities, science and technology and management, etc.

Lourd et al. [41] assert that sustainable development education should not only mobilize different disciplines, it should also open new fields and incite interrogation about sustainability. Teaching sustainability should also emphasize the stakes and complexities that are associated with sustainability on a real case and collaborative negotiation and consultation with the various stakeholders. The importance of sustainability issues like environmental preservation, economic

empowerment, gender equality, good governance, resource conservation, global warming, health and safety, livable settlements as well as other social and economic issues should also be infused into the curriculum. Demonstrating more sustainable practices on campus will provide a model for alumni to take the initiative elsewhere.

##### 4.3.3. Research and development (R&D)

Universities, through R&D, can promote sustainability through developing more effective ways of dealing with environmental and social problems if civilization is going to move ahead. They can achieve that by coming up with ways of addressing global problems like climate change, poverty, HIV, and child-killer diseases. R&D should promote the development of renewable energy sources that integrate wind and solar energy, and other renewable form into modern electricity grids, as well as carbon capture and storage that could provide the long-term key to reducing emissions in coal-fired electricity generation. R&D should also focus on development of cleaner kinds of products, effective ways of resource conservation and availability of basic human needs such as food and shelter and support education and public health services needed for social development. Universities should also take on sustainability as a great challenge in research by promoting the sustainable designs of neighborhoods, environmental justice, and good governance.

This proposed integrated approach to achieving campus sustainability could also help universities increase efficiency of operations by removing waste from research, learning and other processes, increase awareness of environmental impacts of operations among all faculty, staff and students, and establish a strong image of university social responsibility. An integrated approach to promoting sustainability is a comprehensive way of addressing environmental compliance issues [19].

## 5. Sustainability considerations for university campuses

There is a need for enormous considerations in order to achieve effective physical planning and sustainability of university campuses and for managing the impacts of the daily operations and the activities of the universities. When establishing a university, there should be adequate environmental and sustainability concerns in the campus physical and academic planning processes. Furthermore, when formulating university policies, visions and targets, the three pillars of sustainability (safeguarding environment, economic management and social justice) should be incorporated and prioritized so as to avoid a possibility of formulating a policy that will be detrimental to the environment or the present and the next coming generations of the university community.

Selection of site for locating a new university campus is an important factor in improving environmental sustainability because it can affect transportation needs, water needs, water run-off, utility needs, and natural lighting opportunities. Location of activities and land uses in the universities should be done in such a way that they do not pose environmental threat to the university community. Therefore, effective campus site

selection, orientation of the buildings, and use of the site after construction can positively impact the entire campus environment. Effective site planning and landscape design could also maximize the campus's natural conditions and provides easy access for pedestrians, bikes, and public transit.

Nowadays university campuses are no longer ignored on the global outcry of taking serious actions to safeguard the environment. For very soon, we envisage a situation where by governments would set some regulations enforcing universities to comply with relevant environmental regulations and to certify their environmental management measures. This is because of the realization that universities also contribute greatly to pollution and environmental degradation. Therefore, university decision makers should be proactive in promoting environmental sustainability through implementing this integrated approach as a tool for improving the environmental performance of their activities, reducing the negative impacts of their operations and conserving resources.

Universities should be modeled as centers that can enhance teaching and learning and accommodate the needs of all learners and to serve as center of the community for promoting sustainability that could support the concept that high institutions are important symbols of "place". Universities should also be welcoming to all members of their community and promote partnership and collaboration with all stakeholders in policymaking and planning a sustainable environment for learning and research. This can result in problem solving and innovations that support the goals of a sustainable campus.

There should also be efforts by university management to improve social justice, energy efficiency and security of university community and export these values to the societies outside [9]. These authors support the wholesale implementation of sustainability goal of caring for the total well-being of those who will use the campus buildings and the surrounding environment. This recommendation speaks to the need to create conducive teaching/learning and research environment and also stress the need for universities to be designed to be more humane and personal to promote a sense of community and make effective and sustainable use of all available resources.

Environmental quality improvement initiative aimed at improving water, air and land quality is an effective ingredient in achieving sustainability. Clean air in research and study buildings should be encouraged through the use of non-toxic or low-toxic materials and use natural or high quality mechanical ventilation systems. Improving environmental quality could also be achieved by promoting a beautiful and serene campus landscape free from traffic that promotes a quiet atmosphere for learning. Campus greening also encourages establishing public parks and gardens, campus squares and recreation facilities as well as preserving and maintaining natural features like water bodies (like rivers, streams, fountains, etc.), mountains, forests, etc.

## 6. Conclusion

Every product or service has some impact on the environment. Such impacts can occur at many stages of the product

or service's life cycle, from input to process to ultimate output. Universities are systems that are involved in numerous and complex scientific (laboratory experiments, agricultural practical, workshop operations, etc.) and social and educational activities (teaching, learning and research), energy supply and usage, transport and interaction, sports and recreation etc. They are also heterogeneous and some are very large in size and population. All these combine to warrant a need for a systematic and integrated approach that will make the universities more livable and sustainable.

The university community must be challenged to re-think and re-construct their environmental policies and practices in order to contribute to sustainable development at local, national and international levels [26]. Therefore, university management should make campus sustainability the foundation for campus operations, research, and teaching and strive to conserve natural resources and support their sustainable use through conducting affairs in a manner that safeguards the environmental health and safety of the university community. The approach can communicate the interests and meets the process needs of all participants and streamline and systematizes activities and services to deliver outcomes that aim to improve university environmental performance. Implementation this EMS has economic (employment opportunities), environmental (sustainable resource use) and social (a better quality of life) consequences that go beyond the university campus: spillover effects take place in the totality of the region hosting the university [10,12].

In view of the heterogeneous structure of most universities, it is quite pertinent to develop a campus sustainability approach that will take all types and sizes of universities into consideration and enables it to be used for universities of different structures. In this proposed approach, the outer shape is given, but the concrete form is adjustable according to the priorities of each respective university. The specific roles of universities in promoting sustainable development have been highlighted in a number of significant declarations, including the Kyoto Declaration [35], Agenda 21 [44] and Thessaloniki Declaration [36]. For a university campus to be sustainable, it must preserve the environment, stimulate economic growth, and improve society. It is, therefore, the duties of university management and the community make the university environments sustainable so that the universities can serve as centers for the promotion of global sustainability for the benefit of all.

## Acknowledgement

The authors acknowledge the support of King Fahd University of Petroleum and Minerals, Saudi Arabia and the valuable comments of the reviewers.

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