



The Implementation of Sustainable Practices in Achieving Sustainability Goals in Middle Eastern Universities

Solomon Chukwuemeka Ugbaja*

Department of Business Administration, Istanbul Okan University, 34959 Akfırat-Tuzla, Istanbul, Turkey

*Corresponding author: Solomon Chukwuemeka Ugbaja, Department of Business Administration, Istanbul Okan University, 34959 Akfırat-Tuzla, Istanbul, Turkey; E-mail: schukwuemeka@stu.okan.edu.tr

Received date: 12 October, 2023, Manuscript No. JHHE-23-116627;

Editor assigned date: 16 October, 2023, PreQC No. JHHE-23-116627 (PQ);

Reviewed date: 30 October, 2023, QC No. JHHE-23-116627;

Revised date: 17 October, 2024, Manuscript No. JHHE-23-116627 (R);

Published date: 24 October, 2024, DOI: 10.4172/2325-9647.1000340

Abstract

The aim of this study is to assess the implementation of sustainability practices in Middle Eastern universities. The primary research question focuses on how universities are integrating sustainability practices, particularly in relation to the CORE system, which includes curriculum, operations, research, and engagement. The research methodology primarily involves content analysis of the UI Green Metric ranking and universities' websites of selected universities in the Middle East, based on the UI Green Metric sustainable university assessment and ranking index, to observe their sustainability practices. The UI Green Metric ranking is chosen because it takes into account the operations, curriculum, research, and engagements of universities, encompassing indicators such as setting and infrastructure, energy and climate change, waste, water, transportation, and education. This comprehensive approach covers all three dimensions of sustainability (environment, economy, and society), whereas other indexes like GASU, AASHE: STAR, ESM and others, often focus mainly on operational Eco-efficiency. The sample for the study is selected from the top 224 sustainable universities ranked by the UI Green Metric. The total population observed and evaluated consists of the top 29 Sustainability-focused Universities in the Middle East for the years 2021 and 2022, according to the UI Green Metric sustainable ranking. Observations from the study indicate that the universities under review prioritize sustainability as part of their objectives and have developed plans, policies, and strategies to implement some of their sustainability goals, particularly concerning their management practices. However, the findings suggest that the universities should enhance their efforts in the operational eco-efficiency aspect of the CORE system, including areas like setting and infrastructure, energy and climate change, waste reduction/recycling, water conservation, and transportation.

Keywords: Sustainability; Management practices; Implementation; Sustainability practices; Middle Eastern Universities

Introduction

Over the past few decades, there has been a growing recognition of the importance of incorporating Sustainability practices into both government and non-governmental educational institutions. Particularly, universities play a crucial role in the global economy and are responsible for training a significant portion of professionals who will later lead and work in various sectors, including public, private, and non-profit organizations. As a result, universities have a unique opportunity to shape the path towards a sustainable society. Given their substantial impact on societal values, well-being, and development, universities bear a fundamental responsibility to prioritize education and research focused on sustainability. The significance of this approach lies in the fact that future professionals will find themselves working in companies that increasingly prioritize sustainability in their operations. This places considerable pressure on universities to integrate sustainability into their core principles, ensuring that this mindset permeates all aspects of their institutional identity [1].

Relevance: The significance of this current research is closely tied to ongoing dialogues concerning sustainability practices in universities. These institutions have now come to acknowledge the necessity of acknowledging the undeniable truth that human activities are causing unprecedented and potentially catastrophic impacts on the environment and natural ecosystems. The success of universities in the modern era will be measured by their capacity to champion a proactive agenda that elevates sustainability and environmental concerns to a central position in academic endeavors.

The purpose of the study: The primary objective of this research is to examine and assess the content analysis of sustainability-oriented practices within the leading Middle Eastern universities that prioritize sustainability. The anticipated outcomes of this study aim to establish a foundation that sheds light on how prepared and inclined other universities are when it comes to integrating sustainability into their Curriculum, Operations, Research, and Engagement/outreach (C.O.R.E. system). Furthermore, the findings from this research have the potential to provide insights into the current state of sustainability practices in Middle Eastern universities. Ultimately, the study results hold the promise of guiding decision-makers and universities across the Middle East in adopting sustainable practices within their management systems. This, in turn, will help raise awareness and commitment to sustainability among their students. As these universities are responsible for preparing the majority of professionals who will later lead, manage, and teach in public, private, and non-governmental institutions, they possess a unique capacity to influence the trajectory of a sustainable society.

Research question: This current research is driven by a fundamental question: How do top sustainability-focused Middle Eastern universities incorporate sustainability-oriented practices within their CORE system (Curriculum, Operations, Research, and Engagement)? In essence, this study aims to evaluate the extent to which Middle Eastern universities integrate sustainability-oriented practices [2]. The assessment is based on insights gathered from twenty-nine (29) leading sustainability-focused universities in the region. These universities were selected according to their ranking in the UI Green Metric sustainability assessment for both 2021 and 2022.

Literature Review

The Brundtland report provided the initial definition of sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). This definition emphasizes the interconnectedness of economic, social, and environmental aspects of corporate actions, often referred to as the 'triple bottom line.' In recent times, various definitions of sustainable higher education institutions have surfaced. Alshuwaikhat and Abubakar argue that a sustainable campus should prioritize environmental health by conserving energy and resources, reducing waste, and implementing effective environmental management. Additionally, it should promote equity and social justice and extend these values to the surrounding community [3].

According to Milutinovic and Nikoli, the vision of sustainable development in higher education entails a world where everyone has access to a quality education and learns the values, behaviors, and lifestyles necessary for a sustainable future and positive societal transformation.

Over the past two decades, there has been a noticeable increase in higher education institutions actively incorporating sustainability into their operations. This trend can be attributed to a heightened awareness in society about sustainability issues and a growing understanding of the significant impact campus activities have on the environment and local communities. This contribution to sustainability can manifest in various aspects of university functioning, including education, research, outreach/engagement, and administrative management. Therefore, it becomes essential to assess the extent of universities' efforts in integrating sustainability. Sustainable development is founded on three pillars: economic, environmental, and social, as mentioned earlier. These three dimensions are frequently employed in various development initiatives and are often referred to as the triple bottom line. Ensuring equal consideration is given to each dimension is crucial for achieving sustainable outcomes.

Figure 1 illustrates that achieving sustainable outcomes requires a delicate balance among the three components. If any one component dominates the others, the result will not be sustainable. Scholars have emphasized the fundamental types of activities conducted in higher education institutions while assessing the key elements in the transformative process towards sustainability.

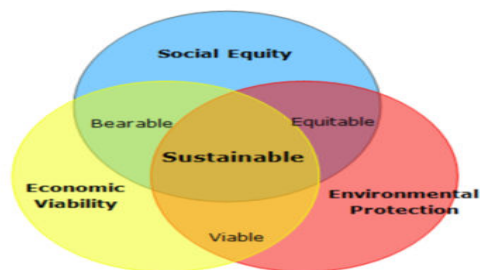


Figure 1: Pillars of sustainability.

For example, Christensen et al., identified that the primary activities are linked to operations and maintenance, teaching, research, and engagement, involving cooperation with local communities, companies, and the media [4]. Similarly, various definitions concentrate on these activities as a C.O.R.E. system. The abbreviation represents curriculum, operations, research, and engagement. The

CORE model is designed as a comprehensive guide for the holistic implementation of sustainability initiatives across the entire campus.

Such models are built on assessments like the one proposed by Lukman and Glavic, who argue that desirable outcomes of sustainability-oriented practices include fostering research, technical development, and innovations within a knowledge-based society. Incorporating sustainability-oriented practices into everyday activities requires identifying variables such as management performance (vision, mission, statement, strategy, and sustainability council/coordinator), education and research (programs, curriculum, teaching methods), operations, forming networks, and reporting to stakeholders (assessment tools, sustainability indicators) [5]. The integration of the C.O.R.E. system/model enriches the construction of a framework for sustainability assessment in universities, particularly in approaches to management practices.

Sustainability in Middle Eastern higher education

In recent years, universities across the Middle East have made significant strides in implementing sustainable practices, recognizing the importance of environmental stewardship and promoting a greener future (Figure 2).



Figure 2: Middle Eastern map.

Energy efficiency: Middle East universities prioritize energy efficiency measures to reduce their carbon footprint. A study by Al-Sari et al., examined energy management practices in universities in Saudi Arabia, highlighting the implementation of energy-efficient lighting, HVAC systems, and smart controls. The study demonstrated substantial energy savings and emphasized the importance of energy management strategies in achieving sustainability goals [6].

Renewable energy integration: Embracing the region's abundant renewable energy potential, Middle East universities are adopting renewable energy sources. Research by Al-Mansour and Rezgui investigated the integration of solar energy in university campuses in Qatar, emphasizing the role of photovoltaic systems in reducing carbon emissions and promoting sustainability.

Waste management and recycling: Waste management practices play a crucial role in sustainable campuses. A study by Alnajem and Alshuwaikhat assessed waste management practices in universities in Kuwait, highlighting the importance of waste separation, recycling programs, and composting initiatives in reducing landfill waste and promoting sustainability.

Water conservation: Water scarcity in the Middle East has prompted universities to adopt water conservation practices. Research by El-Fadel et al., examined water management practices in universities in Lebanon, emphasizing the implementation of water-efficient fixtures, rainwater harvesting, and treated wastewater reuse for irrigation purposes.

Sustainable transportation: Middle East universities are promoting sustainable transportation options to reduce carbon emissions. A study by Al-Tonsi et al., explored sustainable transportation practices in universities in Egypt, highlighting the importance of promoting cycling infrastructure, public transit use, and carpooling programs to mitigate environmental impacts.

Sustainability education and research: Middle East universities are dedicated to sustainability education and research. A study by Salama et al., investigated sustainability education in Gulf Cooperation Council (GCC) universities, emphasizing the importance of integrating sustainability principles across disciplines and fostering environmental awareness among students and faculty.

Middle East universities, through their commitment to energy efficiency, renewable energy integration, waste management, water conservation, sustainable transportation, and sustainability education, are driving positive change towards a more sustainable future [7].

Sustainability assessment tools

According to the sustainability model, sustainability encompasses a comprehensive and interconnected approach that includes economic, environmental, and social aspects (Figure 3). Sustainability-oriented practices inherently possess multiple dimensions and are structured around economic, environmental, and social considerations. Rarely does an activity remain strictly one-dimensional (e.g., solely environmental) because it usually has implications on economic and social aspects as well. Similarly, a university's performance aspects such as research, education, and environmental protection are interconnected and multifaceted. All these aspects must be evaluated when considering the sustainability of the university. Activities like research, development, investment, and matriculation are closely linked to the economic dimension of university development.



Figure 3: A sustainable development model.

The assessment of sustainability in universities has been examined with a number of critical reviews and meta-analyses on the use of various assessment tools. It can be seen that a great deal has been written about sustainability, sustainability in higher education and assessment, measures and ranking of sustainability [8]. However, most of this is in regional, national or local contexts or case studies of single university's attempts to establish and measure sustainability. There is still relatively little in the literature on global sustainability assessment and rankings in higher education.

UI GreenMetric a global sustainability assessing and ranking tool for university addresses this lack. It is the first and the only ranking that measure each participating university's commitment in developing an 'environmentally friendly' infrastructure. The mission for the assessment and ranking of UI GreenMetric was that it is of interest and accessible to universities in developing countries as well as to those in developed countries. It provides an entry-level tool for assessing campus sustainability efforts [9]. The assessment and ranking emerged out of a number of disparate concerns and realizations regarding the challenge of introducing sustainable concepts in a Sustainability Environmental Assessment (SEA) context. The other aspects of the mission for the assessment and ranking were that it be global in scope, raise awareness in sustainability and are a driver of change. The evaluation of sustainability in universities has been thoroughly explored through critical reviews and meta-analyses that examine various assessment tools. Numerous studies have been dedicated to sustainability, particularly in higher education, focusing on measures and rankings related to sustainability. However, the majority of these studies are centered on regional, national, or local contexts, or they present case studies of individual universities' efforts to establish and measure sustainability. As a result, there remains a limited amount of literature on global sustainability assessment and rankings in higher education.

To address this gap, the UI GreenMetric was introduced as a global sustainability assessment and ranking tool specifically designed to meet this need. It stands as the first and only ranking system that evaluates each participating university's commitment to developing an environmentally friendly infrastructure. The primary mission behind the creation of the UI GreenMetric was to make it accessible and relevant to universities in both developing and developed countries. It serves as an entry-level tool for assessing campus sustainability endeavors [10]. The assessment and ranking of UI GreenMetric were born from various concerns and realizations about the challenges associated with incorporating sustainable concepts within a Sustainability Environmental Assessment (SEA) context. Additionally, the mission sought to establish a global scope for the ranking, raise awareness about sustainability, and act as a driving force for positive change (Table 1).

Category	Percentage of total points (%)
Setting and Infrastructure (SI)	15
Energy and Climate Change (EC)	21
Waste (WS)	18
Water (WR)	10
Transportation (TR)	18
Education (ED)	18
Total	100

Table 1: The UI GreenMetric categories used in the assessing, ranking and their weighting sustainability in universities.

Setting and infrastructure: The assessment of campus setting and infrastructure provides essential insights into the university's commitment to creating an environmentally friendly environment. This indicator also serves to evaluate whether the campus can be labeled as a green campus. The objective is to motivate participating universities to allocate more space for green areas, contribute to environmental preservation, and develop sustainable energy practices [11].

Energy and climate change: The University's attention to energy usage and climate change holds the highest weightage in the ranking. Several indicators are defined within this area, including energy-efficient appliance usage, policies on renewable energy usage, total electricity consumption, energy conservation programs, green building initiatives, and programs aimed at climate change adaptation and mitigation, along with policies on reducing greenhouse gas emissions. Through this indicator, universities are encouraged to intensify their efforts in achieving energy efficiency in their buildings and prioritize nature and energy resource conservation [12].

Waste: Waste treatment and recycling practices are crucial factors in fostering a sustainable environment. Given the considerable waste generated by university staff and students on campus, specific programs and waste treatments should be a priority for the university.

Key elements include recycling programs, toxic waste recycling, organic and inorganic waste treatment, sewerage disposal, and policies to reduce the use of paper and plastic on campus.

Water: Water usage on campus is another significant indicator in GreenMetric. The objective is for universities to decrease water consumption, enhance conservation programs, and protect natural habitats. Criteria for assessment include water conservation programs and the use of piped water.

Transportation: The transportation system plays a pivotal role in carbon emissions and pollutant levels within the university. Implementing transportation policies to limit the number of motor vehicles on campus and encouraging the use of campus buses and bicycles contribute to a healthier environment. The pedestrian policy fosters a culture of walking around campus and discourages private vehicle usage. Additionally, utilizing environmentally friendly public transportation options helps reduce the carbon footprint around the campus.

Education: This criterion holds 18% of the total score and was expanded based on the belief that universities play a vital role in cultivating a new generation that is conscious of sustainability principles (Table 2).

No.	Categories and indicators	Points weighting
1	Setting and Infrastructure (SI)	16% (1500)
SI 1	Open space area/total area	300
SI 2	Open space area/total people	300
SI 3	Area on campus covered in forested vegetation	200
SI 4	Area on campus covered in planted vegetation	200
SI 5	Non-retentive surfaces/total area	100
SI 6	Sustainability budget/total university budget	400
	Total	1500
2	Energy and Climate Change (EC)	21% (2100)
EC 1	Energy efficient appliance usage	300
EC 2	Renewable energy usage policy	300
EC 3	Total electricity use/total people	300

EC 4	Green building	300
EC 5	Climate change adaptation and mitigation program	300
EC 6	Greenhouse gas emission reduction policy	600
	Total	2100
3	Waste (WS)	18% (1800)
WS 1	Recycling program for university waste	300
WS 2	Toxic waste recycling	300
WS 3	Organic waste treatment (garbage)	300
WS 4	Inorganic waste treatment (rubbish)	300
WS 5	Sewerage disposal	300
WS 6	Policy to reduce the use of paper and plastic on campus	300
	Total	1800
4	Water (WR)	10% (1000)
WR 1	Water conservation program	500
WR 2	Piped water	500
	Total	1000
5	Transportation (TR)	18% (1800)
TR 1	Total cars entering total people	300
TR 2	Total bicycles/total people	200
TR 3	Transportation policy on limiting vehicles on campus	300
TR 4	Transportation policy on limiting parking space	200
TR 5	Campus buses	300
TR 6	Bicycle and pedestrian policy	500
	Total	1800
6	Education (ED)	18%
ED 1	Sustainability courses/total courses	300
ED 2	Sustainability research funding/total research funding	300
ED 3	Sustainability publications	300
ED 4	Sustainability events	300
ED 5	Sustainability organizations (student)	300
ED 6	Sustainability website	300
	Total	1800

Table 2: Indicators used in assessing and ranking sustainability in universities by UI GreenMetric.

Based on the information provided in Table 1 and 2, this research aims to conduct a quantitative study by incorporating the cardinal dimensions of sustainability, integrated with the C.O.R.E System/ Model (Curriculum, Operation, Research, and Engagements). The

objective is to observe and assess the sustainability-oriented practices of the eleven leading Asian universities focused on sustainability, as ranked by UI GreenMetric [13].

Methodology

This research aimed to observe and evaluate the management practices concerning sustainability implementation in Middle Eastern universities. The main question addressed in this study was: Do sustainability-focused Middle Eastern universities manage the implementation of sustainability in their CORE system (Curriculum, Operations, Research, and Engagement)?

To answer this question, the research utilized content analysis of UI GreenMetric and universities' websites to examine how universities implement and manage sustainability-related practices. The UI GreenMetric sustainable university assessment and ranking index was chosen due to its comprehensive consideration of the Operations, Curriculum, Research, and Engagements (CORE system) of universities. The index incorporates various indicators, including setting and infrastructure, energy and climate change, waste, water, transportation, and education. This approach covers all three dimensions of the triple bottom line of sustainability (environment, economy, and society), which sets it apart from other indexes like GASU, GEENSHIP, AASHE: STAR, ESM, and others that predominantly focus on operational eco-efficiency [14].

Procedure for data collections and analysis: The study's sample was drawn from a pool of approximately two hundred and twenty-four

(224) universities worldwide, which were recognized as top sustainable institutions based on the UI GreenMetric index for the year 2021. The focus of this research was specifically on the top twenty-nine (29) sustainability-focused universities in the Middle Eastern region, as determined by their rankings in the UI GreenMetric sustainable ranking index. Consisting of twenty-five (25) universities in each year. The study sample includes King Abdulaziz University, Istanbul Technical University, Al-Balqa Applied University, Cyprus International University, University of Sharjah, Erciyes University, Ozyegin University, Yildiz Technical University, Yeditepe University, University of Zanjan, Ege University, An-Najah National University, American University of Beirut (AUB), American University in Cairo, Middle East Technical University, University Of Anbar, Qassim University, Kashan University of Medical Sciences and Health Services, Bartin University, Aksaray University, University of Kashan, University of Babylon, Al Ain University, University of Mohaghegh Ardabili, and Jordan University of Science and Technology, Princess Nourah Bint Abdulrahman University, Holy Spirit University of Kaslik (USEK), Al-Mustaqbal University College, and Alzahra University (Table 3) [15].

World ranking	Universities	Country
38	King Abdulaziz University	Saudi Arabia
47	Istanbul Technical University	Turkey
57	Al-Balqa Applied University	Jordan
71	Cyprus International University	Turkey
81	University of Sharjah	United Arab Emirates
86	Erciyes University	Turkey
94	Ozyegin University	Turkey
95	Yildiz Technical University	Turkey
106	Yeditepe University	Turkey
107	University of Zanjan	Iran
108	Ege University	Turkey
116	An-Najah National University	Palestine
133	American University of Beirut (AUB)	Lebanon
134	American University in Cairo	Egypt
135	Middle East Technical University	Turkey
146	University of Anbar	Iraq
153	Qassim University	Saudi Arabia
156	Kashan University of Medical Sciences and Health Services	Iran
159	Bartın University	Turkey
162	Aksaray University	Turkey

163	University of Kashan	Iran
164	University of Babylon	Iraq
168	Al-Ain University	United Arab Emirates
169	University of Mohaghegh Ardabili	Iran
178	Jordan University of Science and Technology	Jordan
71	Princess Nourah Bint Abdulrahman University	Saudi Arabia
117	Holy Spirit University of Kaslik (USEK)	Lebanon
156	Al-Mustaqbal University College	Iraq
167	Alzahra University	Iran

Table 3: Top Twenty-nine Middle Eastern Sustainable Universities between 2021 and 2022 with their countries.

Data collection occurred during July 2023. To assess and quantify the data, the researcher employed descriptive data analysis to ascertain the accuracy and significance of the current situation. Descriptive data analysis involves calculating percentage distributions. The formula utilized in this study to calculate percentages is as follows:

$$\frac{\text{University Total Score in each Category}}{\text{UI Green Metric Total Score in each Category}} \times \frac{100}{1} = \%$$

The choice of using percentage as the method of data analysis was based on its ability to provide a clear and straightforward representation of the situation without the intricacies of other statistical techniques [16]. The data analysis employed in this study includes the presentation of

findings through tables, charts, and diagrams, effectively illustrating the prevalent sustainability practices observed in the selected universities.

Results and Discussion

Finding and evaluation

The findings revealed that top sustainability-focused Middle Eastern universities have demonstrated varying degrees of commitment to sustainability and are actively striving to integrate it within their institutions. Table 4 displays the outcomes of the UI Green Metric assessment and ranking for the selected Middle Eastern universities in 2021 and 2022, along with their respective scores on each indicator.

CORE system		Operation											Curriculum, research and engagement		
UI GreenMetric sustainability indicators		Total score		Setting and infrastructure		Energy and climate change		Waste		Water		Transportation		Education	
University		10000		1500		2100		1800		1000		1800		1800	
		2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
1	King Abdulaziz University	8450	8660	1375	1375	1400	1635	1650	1650	950	900	1475	1425	1600	1675
2	Istanbul Technical University	8150	8585	1225	1275	1400	1535	1575	1575	900	900	1400	1575	1650	1725

3	Al-Balqa Applied University	8150	8475	1200	1250	1725	1850	1200	1350	850	800	1550	1600	1625	1625
4	Cyprus International University	7700	8350	1125	1250	1350	1575	1350	1425	900	1000	1550	1450	1425	1650
5	University of Sharjah	7675	8285	1375	1400	975	1385	1500	1650	1000	1000	1175	1175	1650	1675
6	Erciyes University	7775	8260	1225	1325	1400	1535	1350	1425	800	800	1425	1600	1575	1575
7	Ozyegin University	7850	8225	975	1000	1525	1675	1425	1500	800	800	1450	1500	1675	1750
8	Yildiz Technical University	7725	8225	1025	1175	1450	1625	1275	1350	900	900	1575	1625	1500	1550
9	Yeditepe University	7700	8175	1025	1200	1225	1525	1575	1650	800	800	1500	1425	1575	1575
10	University of Zanjan	7850	8165	1375	1230	1125	1450	1500	1500	1000	1000	1150	1335	1700	1650
11	Ege University	7725	8150	1125	1250	1300	1550	1575	1575	800	800	1425	1425	1500	1550
12	An-Najah National University	-	8075	-	1075	-	1925	-	1050	-	900	-	1400	-	1725
13	American University of Beirut (AUB)	7475	7975	1000	1250	1450	1550	1275	1350	800	750	1375	1450	1575	1625
14	American University in Cairo	7500	7965	875	940	1300	1425	1575	1575	650	950	1375	1400	1725	1675
15	Middle East Technical	7650	7950	1325	1400	1075	1225	1200	1350	850	700	1400	1475	1800	1800

	University														
16	University of Anbar	7475	7850	1175	1150	1700	1700	750	1200	800	700	1525	1525	1525	1575
17	Qassim University	7575	7845	1050	1060	1100	1135	1650	1725	1000	1000	1200	1300	1575	1625
18	Kashan University of Medical Sciences and Health Services	-	7825	-	1225	-	1650	-	1500	-	850	-	1525	-	1075
19	Bartın University	-	7810	-	1150	-	1360	-	1350	-	800	-	1525	-	1625
20	Aksaray University	7650	7800	1200	1250	1125	1275	1575	1575	700	700	1475	1425	1575	1575
21	University of Kashan	7725	7795	875	895	1875	1950	1275	1350	900	850	1425	1525	1375	1225
22	University of Babylon	7650	7785	1375	1375	1400	1525	1200	1350	800	900	1325	1335	1550	1300
23	Al Ain University	7425	7775	1250	1300	1325	1350	1500	1650	800	800	1200	1200	1350	1475
24	University of Mohaghegh Ardabili	7550	7770	1250	1250	1200	1110	1350	1350	850	950	1350	1435	1550	1675
25	Jordann University of Science and Technology	-	7725	-	1175	-	1575	-	1200	-	950	-	1425	-	1400
26	Princess Nourah	8000	-	1275	-	1450	-	1275	-	1000	-	1450	-	1550	-

	Bint Abdulrahman University													
27	Holy Spirit University of Kaslik (USEK)	7675	-	975	-	1600	-	-	700	-	1325	-	1425	-
28	Al-Mustaqbal University College	7525	-	1200	-	1375	-	1275	-	750	-	1575	-	1350
29	Alzahra University	7450	-	1000	-	1300	-	1425	-	600	-	1500	-	1625

Table 4: UI GreenMetric 2021 and 2022 sustainability assessment and ranking of top middle Eastern sustainability focused universities.

Based on the examination of Figures 4 and 5, it is evident that the top sustainability-focused Middle Eastern universities exhibited an above-average performance in the overall implementation of sustainability practices in both 2021 and 2022, as indicated by the results of the UI GreenMetric overall sustainability assessment index. Furthermore, there was a noticeable overall improvement in the performance of all twenty-five top sustainable universities in 2022 compared to their performance in 2021.

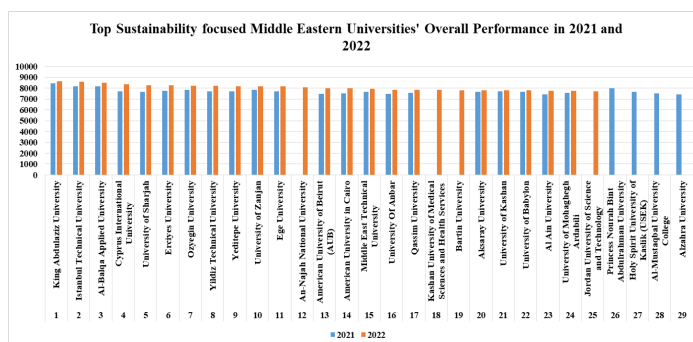


Figure 5: Analysis of top sustainability focused Middle Eastern Universities overall performance between 2021 and 2022 with bar chart.

Table 5 illustrates the percentage analysis of the twenty-nine selected sustainability-focused Middle Eastern universities concerning their sustainability practices in 2021 and 2022, utilizing the CORE system. The Operational aspect of this system encompasses elements such as setting and infrastructure, energy and climate change, waste, water, and transportation. On the other hand, the Curriculum, Research, and Engagement (Outreach) components are collectively considered under Education, as indicated by the UI GreenMetric sustainability assessment indicators.

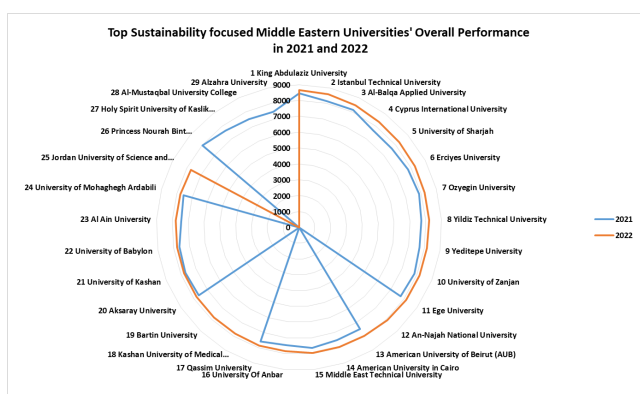


Figure 4: Analysis of top sustainability focused Asian Universities overall performance between 2021 and 2022 with radar.

CORE system		Operation	Curriculum, research and engagement
-------------	--	-----------	-------------------------------------

UI GreenMetric sustainability indicators		Total score		Setting and infrastructure		Energy and climate change		Waste		Water		Transportation		Education	
		10000		1500		2100		1800		1000		1800		1800	
University		2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
1	King Abdulaziz University	84.5	86.6	91.6	91.6	66.6	77.8	91.6	91.6	95	90	81.9	79.1	88.8	93
2	Istanbul Technical University	81.5	85.8	81.7	85	66.6	73	87.5	87.5	90	90	77.7	87.5	91.6	95.8
3	Al-Balqa Applied University Unive rsity	81.5	84.7	80	83.3	82.1	88	66.6	75	85	80	86.1	88.8	90.2	90.2
4	Cyprus International University	77	83.5	75	83.3	64.2	75	75	79.1	90	100	86.1	80.5	79.1	91.6
5	University of Sharjah	76.7	82.8	91.6	93.3	46.4	65.9	83.3	91.6	100	100	65.7	65.7	91.6	93
6	Erciyes University	77.7	82.6	91.6	88.3	66.6	73	75	79.1	80	80	79.1	88.8	87.5	87.5
7	Ozyegin University	78.5	82.2	65	66.6	72.6	69.7	79.1	83.3	80	80	80.5	83.3	93	97.2
8	Yildiz Technical University	77.2	82.2	63.8	78.3	69	77.3	70.8	75	90	90	87.5	90.2	83.3	86.1
9	Yeditepe University	77	81.7	63.8	80	58.3	72.6	87.5	91.6	80	80	83.3	79.1	87.5	87.5
10	University of Zanjan	78.5	81.6	91.6	82	53.5	69	83.3	83.3	100	100	63.8	74.1	94.4	91.6
11	Ege University	77.2	81.5	75	83.3	61.9	73.8	87.5	87.5	80	80	79.1	79.1	83.3	86.1

12	An-Najah National University	-	80.7	-	71.6	-	91.6	-	58.3	-	90	-	77.7	-	85.8
13	American University of Beirut (AUB)	74.7	79.7	66.6	83.3	69	73.8	70.8	75	80	75	76.3	80.5	87.5	90.2
14	American University in Cairo	75	79.6	58.3	62.6	61.9	67.8	87.5	87.5	65	95	76.3	77.7	95.8	93
15	Middle East Technical University	76.5	79.5	88.3	93.3	51.1	58.3	66.6	87.5	85	70	77.7	81.9	100	100
16	University of Anbar	74.7	78.5	78.3	76.6	80.9	80.9	41.6	66.6	80	70	72.6	72.6	72.6	83.3
17	Qassim University	75.7	78.4	70	70.6	52.3	54	91.6	91.6	100	100	66.6	72.2	83.3	90.2
18	Kashan University of Medical Sciences and Health Services	-	78.2	-	81.7	-	78.5	-	83.3	-	85	-	72.6	-	59.7
19	Bartın University	-	78.1	-	76.6	-	64.7	-	75	-	80	-	72.6	-	90.2
20	Aksaray University	76.5	78	80	83.3	53.5	53.5	87.5	87.5	70	70	81.9	79.1	83.3	83.3
21	University of Kashan	77.2	77.9	58.3	59.6	89.2	98.8	70.8	75	90	85	67.8	72.6	76.3	68
22	University of Babylon	76.5	77.8	91.6	91.6	66.6	72.6	66.6	75	80	90	73.6	74.1	86.1	72.2

23	Al Ain University	74.2	77.7	83.3	86.6	63	64.2	83.3	91.6	80	80	66.6	66.6	75	81.9
24	University of Mohaghegh Ardabili	75.5	77.7	83.3	88.3	57.1	52.8	75	75	85	95	75	79.7	86.1	93
25	Jordan University of Science and Technology	-	77.2	-	78.3	-	75	-	66.6	-	95	-	79.1	-	77.7
26	Princess Nourah Noura Bint Abdulrahman University	80	-	85	-	69	-	70.8	-	100	-	80.5	-	86.1	-
27	Holy Spirit University of Kaslik (USEK)	76.7	-	65	-	76.1	-	91.6	-	70	-	73.6	-	79.1	-
28	Al-Mustaqbal University College	75.2	-	80	-	65.4	-	70.8	-	75	-	87.5	-	75	-
29	Alzahra University	74.5	-	66.6	-	61.9	-	79.1	-	60	-	83.3	-	90.2	-

Table 5: Percentage analysis of selected top Middle Eastern sustainability focused universities’ sustainability practices using CORE system and UI GreenMetric indicators between 2021 and 2022

Operation (setting and infrastructure, energy and climate, waste, water and transportation)

Figures 6 and 7 depict the performance of the twenty-nine selected sustainability-focused Middle Eastern universities under the operational aspect of the CORE system. This section includes various elements related to setting and infrastructure, such as campus setting, total areas on campus, areas covered in forested vegetation, areas covered in planted vegetation (including lawns, gardens, green roofs, internal planting), total ground floor area of buildings, number of academic and administrative staff, university budget for sustainability efforts, and retention of non-retentive surfaces for water absorption on campus [17].

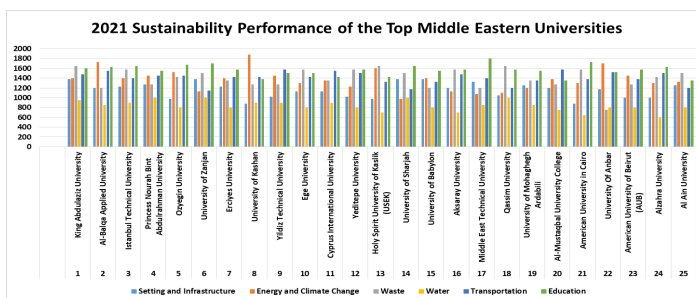


Figure 6: Analysis of the sustainability practices in the studied Universities using the CORE system and UI GreenMetric sustainability Indicators 2021.

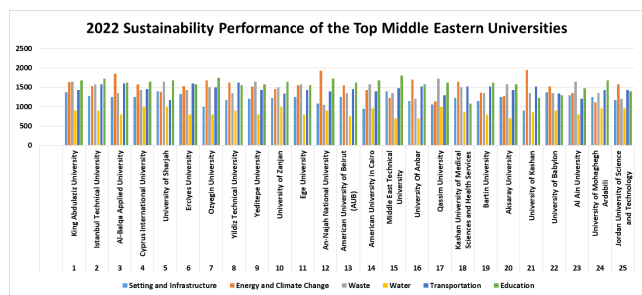


Figure 7: Analysis of the sustainability practices in the studied Universities using the CORE system and UI GreenMetric sustainability indicators 2022.

University of Sharjah and Middle East Technical University maintained a lead over the rest universities with 93.3%, while the rest of other universities were above average in both years. This indicates that the area of setting and infrastructure provides fundamental insights into a university's commitment to fostering a green environment. As depicted in Figures 6 and 7, the scores reveal that the twenty-nine university campuses are still progressing towards being recognized as green campuses, primarily concerning their setting and infrastructure, where there is a need for universities to create more green spaces and prioritize environmental preservation.

Figures 6 and 7 also present a bar chart analysis of the selected universities' performance in Energy conservation and climate change mitigation. This aspect involves factors such as the usage of energy-efficient appliances, policies on renewable energy usage, total electricity consumption, energy conservation programs, green building initiatives, and climate change adaptation and mitigation efforts, including policies on reducing greenhouse gas emissions. University of Kashan leads in 2022 with 98.8% and followed by Al-Balqa applied University with 88.0%. University of Sharjah was below average in 2021 with 46.4% and was above average in 2022 with 65.9%. The rest of other universities were above average in both years. This suggests that the top sustainability-focused Middle Eastern universities are demonstrating a strong commitment to environmental issues and should continue their efforts to address and mitigate climate change [18]. Based on the findings from the analysis of Figure 6 and 7, it is apparent that universities need to further enhance their focus on energy efficiency to achieve a higher level of eco-efficiency in their campuses, contributing to sustainability.

Additionally, concerning waste management, this aspect encompasses critical factors such as the implementation of recycling programs at the university, handling toxic waste recycling, organic waste treatment, inorganic waste treatment, sewerage disposal, and the adoption of policies aimed at reducing the use of paper and plastic during campus activities. These initiatives play a significant role in fostering a sustainable environment. Figures 6 and 7 show that King Abdulaziz University, University of Sharjah, Yeditepe University, Qassim University, Al Ain University, and Holy Spirit University of Kaslik (USEK) maintained a lead with 91.6%, while University of Anbar was below average in 2021 with 41.6%, but was above average in 2022 with 66.6%. These universities have effectively controlled the actions of their staff and students on campus, resulting in significant waste reduction through the implementation of various programs and waste treatment initiatives. Other universities, although performing above average in both years, still have room for improvement in this aspect.

Moreover, concerning water conservation, the focus is on universities' efforts to reduce water consumption, implement water conservation programs, manage piped water usage, and protect natural habitats. Cyprus international university, university of Sharjah, university of Zanjan, Qassim university, and with 100% progress in decreasing their water usage on campus, increase water conservation program, and protect the habitat to a large extent in achieving water conservation in 2022. While Princess Nourah Bint Abdulrahman university scored 100% in water usage in 2021. The rest of the other universities performed above average in both years. The findings reveal that the studied universities have made substantial progress in reducing water usage on campus, implementing effective water conservation programs, and prioritizing habitat protection to a significant extent, leading to successful water conservation efforts. However, further dedication and commitments are still needed for these universities to be recognized as fully sustainable institutions in terms of water conservation.

In the area of transportation, Yildiz technical university leads with a 90.2% score in 2022. While Al-Mustaqbal university college led other universities with 87.5.6% in 2021. The rest of other universities were above average in both years. Recognizing the significant impact of transportation systems on carbon emissions and pollution levels within the university, the management of the studied universities has taken proactive steps to implement transportation policies. These policies aim to restrict the number of motor vehicles on campus, promote the use of campus buses and bicycles for a healthier environment. Additionally, the implementation of pedestrian policies encourages students and staff to walk around campus, discouraging the use of private vehicles. Moreover, universities have also adopted environmentally friendly public transportation options to reduce the carbon footprint in the campus vicinity. However, further commitment from universities in the realm of transportation is necessary to effectively decrease the carbon footprint around campus.

Curriculum, research and engagement (Education): The remaining components of the CORE system, namely Curriculum, Research, and Engagement (Outreach), fall under the Education category. Curriculum involves factors such as the numbers of courses offered that are related to environment and sustainability, along with the total number of courses available. Research includes the total research funds allocated to environmental and sustainability research, the overall research funds, and the number of scholarly publications on environment and sustainability [19]. Engagement entails the count of scholarly events focused on environment and sustainability, the number of staff and student organizations related to these topics, and the presence of a university sustainability website.

The above finding from Figures 6 and 7 shows that the twenty-nine top Middle Eastern Sustainability focused Universities are really above average in implementing sustainability in their curriculum, research and engagement programs. Middle East Technical university leads with 100% in both 2021 and 2022, while the rest of the other universities were above average in both years. This indicates that the studied universities are actively implementing a greater number of sustainability-related courses within their curriculum. In terms of research, these universities are fostering research on sustainability topics among both students and staff, emphasizing the importance of multidisciplinary and interdisciplinary research in sustainability. The universities have made significant strides in publishing research that focuses on sustainability-related issues [20].

In the area of engagement (Outreach), universities have successfully encouraged numerous sustainability activities and projects related to community services and development. This is of utmost importance, considering the pivotal role universities play in shaping the mindset of the new generation towards sustainability. As they prepare the majority of professionals who will go on to manage and teach in both public and private institutions in society, universities bear a fundamental responsibility to provide education, training, and research for sustainability. This progress is crucial since future professionals will work in a global landscape where companies increasingly prioritize sustainability on their agendas (Figure 8).



Figure 8: Common management practices towards the implementation of sustainability in the studied Middle Eastern Universities.

Conclusion

Sustainable practices in universities across the Middle East are becoming increasingly important as institutions recognize the need to address environmental challenges and promote sustainability. While the specific initiatives may vary from one university to another, here are some common sustainable practices adopted by universities in the Middle East:

Energy efficiency: Universities are implementing energy-efficient measures such as installing LED lighting, utilizing natural lighting, optimizing HVAC systems, and promoting energy conservation practices among students and staff. Some universities are also adopting renewable energy sources like solar panels to meet their energy needs.

Waste management: Universities are implementing waste management strategies to reduce, recycle, and properly dispose of waste. This includes initiatives like recycling programs, composting, reducing paper consumption through digitalization, and promoting responsible waste disposal practices on campus.

Water conservation: Due to water scarcity in many parts of the Middle East, universities are implementing water conservation measures. This includes installing water-efficient fixtures, promoting

water-saving practices, implementing rainwater harvesting systems, and using treated wastewater for non-potable purposes like irrigation.

Sustainable transportation: Universities are encouraging sustainable transportation options to reduce carbon emissions and promote greener mobility. They may provide bicycle-sharing programs, promote carpooling, encourage the use of public transportation, and provide electric vehicle charging infrastructure on campus.

Green building and infrastructure: Many universities in the Middle East are constructing or retrofitting their buildings to meet green building standards. This includes incorporating sustainable design principles, using environmentally friendly materials, implementing efficient insulation and ventilation systems, and aiming for energy-efficient certification such as LEED (Leadership in Energy and Environmental Design).

Sustainability education and research: Universities play a crucial role in educating students about sustainability and conducting research on sustainable practices. They offer academic programs and courses related to sustainability, organize workshops and conferences on environmental topics, and facilitate research projects that focus on sustainable development and environmental conservation.

Community engagement: Universities often engage with local communities to promote sustainable practices beyond their campuses. This includes organizing awareness campaigns, offering training programs for community members, collaborating with local organizations on sustainability projects, and participating in regional and international sustainability initiatives.

Green procurement: Universities are adopting sustainable procurement practices by prioritizing eco-friendly products and services. This includes sourcing environmentally friendly office supplies, selecting energy-efficient appliances, and choosing suppliers with sustainable practices and certifications.

Green spaces and biodiversity: Universities are creating green spaces on their campuses, including gardens, parks, and green roofs. These spaces not only provide recreational areas for students and staff but also contribute to biodiversity conservation by supporting native plants and wildlife habitats.

Environmental policy and reporting: Universities are developing environmental policies and sustainability plans to guide their efforts. They are also increasingly publishing sustainability reports to transparently communicate their progress, goals, and challenges related to sustainable practices.

Suggestions

It's worth noting that the extent and implementation of sustainable practices can vary among universities in the Middle East. Some institutions may have comprehensive sustainability strategies, while others may be in the early stages of adopting sustainable practices. Universities across the Middle East have taken significant strides in adopting sustainable practices, recognizing the pressing need to address environmental challenges and promote a greener future. Today, we explore some of the remarkable sustainable initiatives implemented by Middle East universities.

Energy-efficient buildings and renewable energy: Middle East universities are embracing energy efficiency and renewable energy to reduce their carbon footprint. The American University of Sharjah in

the UAE is a shining example. They have integrated energy-efficient systems, including smart lighting, advanced insulation, and motion sensors, resulting in a significant reduction in energy consumption. In Saudi Arabia, King Abdullah University of Science and Technology (KAUST) stand out for its commitment to renewable energy. They have implemented a solar energy plant that supplies a substantial portion of the campus's electricity needs, and King Fahd University of petroleum and minerals in Saudi Arabia has established a solar power plant that supplies a substantial portion of the university's electricity needs. Al-Balqa Applied University, Jordan: The university has implemented several sustainable practices, including the establishment of a solar energy research center and the integration of renewable energy technologies on campus. Masdar Institute of Science and Technology, United Arab Emirates: As a specialized research university, Masdar Institute focuses on sustainable development and renewable energy. They have implemented sustainable building design, renewable energy integration, and waste management practices.

Waste management and recycling: Waste management is a key area of focus for sustainable practices in Middle East universities. Qatar University has implemented an extensive recycling program, encouraging students and staff to recycle paper, plastic, and electronic waste. The University of Bahrain has adopted innovative approaches to waste management by introducing on-campus composting facilities and utilizing the compost in their landscaping projects. Waste management practices play a significant role in sustainable campuses. The American University in Cairo, Egypt, has implemented comprehensive waste management programs, including recycling initiatives and composting systems to divert waste from landfills. King Abdulaziz University in Saudi Arabia has established recycling centers across its campus and implemented awareness campaigns to promote recycling among students and staff.

Water conservation: Water scarcity is a pressing issue in the Middle East, making water conservation a top priority for universities. The American University of Beirut (AUB) has implemented a comprehensive water management plan, including the use of treated wastewater for irrigation and the installation of water-saving fixtures on campus. The United Arab Emirates University has adopted innovative technologies such as smart irrigation systems and water-efficient landscaping to reduce water consumption. Water scarcity is a critical issue in the Middle East, prompting universities to adopt water conservation practices. King Abdullah University of Science and Technology (KAUST) in Saudi Arabia have implemented advanced water-saving technologies, such as smart irrigation systems and leak detection systems, to reduce water waste.

Sustainable transportation: Middle East universities are promoting sustainable transportation options to reduce carbon emissions. The American University in Cairo encourages students and staff to use bicycles by providing dedicated bike lanes and bike-sharing programs on campus. The Effat University in Saudi Arabia has implemented a carpooling system to reduce traffic congestion and encourage sustainable commuting among its community. The American University of Sharjah in the UAE encourages cycling by providing dedicated bike lanes, bicycle-sharing programs, and bike-friendly infrastructure on campus. American University of Beirut, Lebanon: The University has implemented various sustainability initiatives, including the development of a green roof on one of its buildings and the promotion of sustainable transportation options.

Sustainability education and research: Middle East universities play a vital role in promoting sustainability education and conducting research. The Masdar Institute of Science and Technology in the UAE focuses on renewable energy and sustainable technologies. Their research initiatives contribute to the development of innovative solutions for a sustainable future. The Sultan Qaboos University in Oman offers interdisciplinary programs on environmental sustainability, equipping students with the knowledge and skills to address environmental challenges. The King Saud University in Saudi Arabia offers academic programs and research centers focused on sustainable development and environmental sciences. The American University of Dubai has established the center for green buildings and renewable energy to promote research and innovation in sustainable architecture and renewable energy technologies.

Community engagement: Middle East universities actively engage with local communities to promote sustainable practices beyond their campuses. The American University of Kuwait collaborates with local organizations and government entities on community projects, including environmental awareness campaigns and sustainable development initiatives. King Fahd University of Petroleum and Minerals in Saudi Arabia partners with local communities to implement renewable energy projects, contributing to the region's sustainable development.

Middle East universities are at the forefront of sustainable practices, implementing energy efficiency measures, promoting waste management, conserving water, encouraging sustainable transportation, and fostering sustainability education and research. Through these collective efforts, they are shaping a more sustainable future for the region

This study demonstrates that all twenty-nine top sustainability-focused Middle Eastern universities included in the research are actively implementing sustainability practices and are performing above average in this regard. The observations indicate that these universities have integrated sustainability into their goals, policies, and strategies, and have taken steps to implement sustainability initiatives to address the demands of creating a sustainable society, starting with their management practices.

Based on the findings, the universities need to intensify their efforts in the operational eco-efficiency aspect of the CORE system, which includes areas like setting and infrastructure, energy and climate change, waste reduction/recycling, water conservation, and transportation. In the area of education, which encompasses curriculum, research, and engagement in the CORE system, all the universities performed above average, but there is room for further commitment in this aspect, given its importance in educating students and society about sustainability.

It is crucial for all universities in the Middle East to take sustainability seriously and incorporate it into their management practices, considering their pivotal role as contributors to the global economy and as major influencers in shaping a sustainable society. The success of universities in the twenty-first century will be measured by their ability to prioritize sustainability and environmental considerations as integral components of academic practice.

While this research examined the implementation of sustainability practices through the UI GreenMetric sustainable ranking index, website contents, and sustainability annual reports, it did not directly measure stakeholders' perceptions of these practices. It is essential to gauge stakeholders' opinions, as their feedback can shed light on

whether these practices align with their expectations and if they perceive them as genuine commitments towards sustainability. Future studies could explore the impact of sustainability practices on stakeholders' perceptions and loyalty towards the universities.

The recommendations arising from the findings of this research, which highlight areas of improvement in the implementation of sustainability practices by the studied universities, are as follows:

- Engage in the delivery of a sustainable campus infrastructure with all construction and refurbishment projects rated BREEAM excellent.
- Encourage more people to commute by walking, cycling, and car-sharing.
- Maximize biodiversity on campus and create additional green environments.
- Establish a sustainable food culture by providing fair-trade products and collaborating with local food partners to increase the availability of seasonal, local, and organic food.
- Embed sustainable procurement practices by sourcing from socially, ethically, and environmentally responsible businesses.
- Foster business community partnerships to support the community and local, regional, and social enterprises.
- Prioritize education for sustainable development, enriching learning across the formal and non-formal curriculum.
- Advance the development of education potential for sustainable development, particularly in relation to enhancing the students' and staff experience and building a more sustainable university.
- Promote and advance research in education for sustainable development to further the university's cross-institutional sustainability agenda and raise its profile in the higher education sector.
- Undertake substantial sustainability research to provide solutions for pressing sustainability issues.
- Facilitate internal communications and enhance research interaction for sustainability within the university.
- Promote sustainability research and establish the Institute of sustainability solutions research as the primary point of contact for organizations seeking to engage with the university on sustainability.
- Increase the impact of sustainability research.
- Support multi-disciplinary funding and identify and communicate funding opportunities to support teams and their project ideas for sustainability research.

References

1. Abi Zeid Daou A, Bou Zaki P (2016) Campus sustainability in the Arab world: The case of the American University of Beirut. *Procedia Environ Sci* 34: 422-433.
2. Aljarrah M, Al-Saadi HS (2017) Integration of Renewable Energy Technologies in Jordan: A Case Study of Al-Balqa Applied University. *Energy Procedia* 110: 325-330.
3. Al-Mansour F, Rezgui Y (2019) Solar energy in university campuses: A case study of Qatar. *Energy Procedia* 158: 5327-5332.
4. Alnajem S, Alshuwaikhat H (2020) Sustainable waste management practices in universities: A case study of Kuwait. *Sustainable Cities and Society* 52: 101808.
5. Al-Sari MI (2020) Energy management practices in Universities of Saudi Arabia. *Energies*, 13: 3534.
6. Alshuwaikhat HM, Abubakar I (2008) An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. *J Clean Prod* 16: 1777-1785.
7. Al-Tonsi A H (2019) Sustainable transportation on university campuses: A case study of Egypt. *Transportation Research Procedia* 41: 625-633.
8. Baharuddin Z, Selamat NF, Hashim NH, Jaafar NF (2021) Sustainable development in higher education: A review of the National University of Malaysia's initiatives. *J Sustainability Sci Manag* 16: 1-17.
9. Balakrishnan BK, Jagadish R, Gowri S (2019) Sustainable building rating systems: A comparative study of green building rating systems in India. *Sustainable Cities and Society* 51: 101736.
10. Ceulemans K, de Prins M, Cappuyns V, de Coninck W (2011) Integration of sustainable development in higher education's curricula of applied economics: Large-scale assessments, integration strategies and barriers. *J Manag Organ* 17: 621-640.
11. Chan EHW, Wu M (2018) Evaluation of sustainability in higher education institutions: A review. *Int J Environ Res Public Health* 15: 1265.
12. Chen Y, Wong J (2019) Exploring the role of student-led environmental organizations in campus sustainability: A case study of Hong Kong. *J Clean Prod* 240: 118220.
13. Christensen P, Thrane M, Jorgensen TH, Lehmann M (2009) Sustainable development: Assessing the gap between preaching and practice at Aalborg University. *Int J Sustainability Higher Educ* 10: 4-20.
14. de Castro R, Jabbour CJ (2013) Evaluating sustainability of an Indian university. *J Clean Prod* 61: 54-68.
15. El-Fadel M (2017) Water management in higher education institutions in Lebanon: Towards sustainability. *Water Prac Technol* 12: 957-968.
16. Ferrer-Balas D, Adachi J, Banas S, Davidson CI, Hoshikoshi A, et al. (2008) An international comparative analysis of sustainability transformation across seven universities. *Int J Sustainability Higher Educ* 9: 295-316.
17. Hills EA (2009) John Aber, Tom Kelly and Bruce Mallory (eds.): *The Sustainable Learning Community: One University's Journey to the Future*. Durham: University of New Hampshire Press.
18. Hoff K, Stiglitz JE (2016) Striving for balance in economics: Towards a theory of the social determination of behavior. *J Eco Behav Org* 126: 25-57.
19. Jabbour CJ (2010) Greening of business schools: A systemic view. *Int J Sustainability Higher Educ* 11: 49-60.
20. Jorge ML, Madueno JH, Cejas MY, Pena FJ (2015) An approach to the implementation of sustainability practices in Spanish universities. *J Clean Prod* 106: 34-44.