
Research article

Sustainability in the Middle East: Progress, Challenges, and Future Directions

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ABSTRACT

The construction and built environment sector is one of the largest contributors to global pollution, yet it is also one of the most promising opportunities for decreasing environmental degradation and encouraging responsible resource management. Sustainable design and building have been a recent trend in regions like the Middle East where natural resources are limited, and the situation is complicated by socio-political intricacies. This study discusses the progress made and the obstacles that remain in achieving sustainable development in the Middle East. The United Arab Emirates, Qatar, and Lebanon have introduced green construction rules as part of a regional commitment to environmental stewardship, underpinned by high-profile buildings that have attracted international attention. Sustainability objectives have been pushed forward by corporate social responsibility efforts that include commercial sector actors in community-focused projects. These successes, however, are undermined by severe water shortages, low levels of public knowledge about environmental issues despite relatively high levels of educational attainment, and logistical and financial challenges of converting the existing building stock. Middle Eastern countries have historically shown tenacity in overcoming adversity, and their path toward sustainable development implies a similar will to tackle these modern difficulties.

1. Introduction

When industry professionals refer to "sustainable development," they typically invoke the classic definition articulated by the United Nations World Commission on Environment and Development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"[1-3]. This framework rests upon three interdependent pillars-economic viability, environmental integrity, and social equity. In the contemporary global context, where poverty persists for a significant portion of humanity, consumption patterns have doubled, and environmental pollution continues to escalate, the imperative for sustainable living has never been more urgent. The construction industry, as one of the most environmentally taxing sectors, offers substantial potential for mitigating pollution and curbing resource overconsumption. The Middle East, characterized by rapid population growth and an expanding tourism sector, faces mounting demand for infrastructure and diverse building projects-

spanning retail, commercial, and residential developments. In 2013 alone, the total value of construction projects within the Gulf Cooperation Council (GCC) reached an estimated US\$1.67 trillion, with Saudi Arabia and the United Arab Emirates accounting for over 68% of this figure[4, 5]. With such immense opportunity, however, comes commensurate responsibility. While global momentum shifts toward sustainable systems, the Middle East has made notable efforts to keep pace, though progress has been uneven due to persistent economic, political, social, and technical barriers. This article provides a critical overview of the sustainability landscape in select Middle Eastern countries, summarizing key achievements, analyzing persistent difficulties, and outlining future directions within the built environment sector[6, 7]. Beyond the built environment, sustainability-oriented analytical frameworks have also been used to examine productivity and performance in complex supply chains, illustrating the broader applicability of sustainability research across economic sectors [46]. Quantitative reliability and lifetime-data approaches can also support sustainability-oriented decision-making by improving the evaluation of engineering materials and environmental phenomena under practical operating conditions [48].

2. Green Building Codes

Since sustainability is a relatively new field of study, it should be developed as an integrated approach, not as a separate notion. Green building codes are regulatory instruments that enable stakeholders to learn, adopt, and infuse sustainable practices over time. Some Middle Eastern countries have created their own green building regulations based on international benchmarks like the Leadership in Energy and Environmental Design (LEED) and the Building Research Establishment Environmental Assessment Method (BREEAM) to match their specific environmental conditions and market needs[4, 8].

2.1 GSAS – Qatar

One of the first home-grown green building assessment systems in the region, the Qatar Sustainability Assessment System (QSAS), later renamed the Global Sustainability Assessment System (GSAS), was officially introduced in 2009. GORD, the Gulf Organization for Research and Development, a subsidiary of the QATARI DIAR Real Estate Investment Company, developed GSAS. GSAS aims to promote sustainable and healthy building practices in Qatar and the broader Middle East region. The approach was developed from scratch after a thorough examination of current worldwide green building frameworks[9, 10]. Some nations in the Middle East and North Africa have shown interest in using GSAS as a common regional standard. The evaluation criteria are divided into eight categories: water, energy, indoor environment, cultural and economic value, site selection, urban connectivity, materials, and management and operations. Energy and water carry the most weight, reflecting their crucial importance to Qatar's sustainability issues[11, 12].

2.2 Estidama – United Arab Emirates

The UAE and Abu Dhabi specifically have led the area in the development and implementation of green construction rules. The emirate has established comprehensive green building requirements for buildings, villas, and communities through the Pearl Rating System overseen by the Abu Dhabi Urban Planning Council. Private developments are obliged to obtain at least 1 Pearl, and government initiatives are required to achieve 2 Pearls [13, 14]. Estidama is built on four pillars, the traditional three of environmental, economic and social sustainability, plus a fourth dimension of cultural preservation. The code was intended to encourage the optimal use of resources in accordance with the city's particular development aspirations, and to support Plan 2030, a strategic urban planning project. The rating criteria are grouped into seven categories: integrated development process, natural systems, liveable buildings/communities, precious water, resourceful energy, stewarding materials and inventive practice. Water and energy are weighted most strongly, as in the GSAS, because of their essential significance in project sustainability[15].

2.3 ARZ – Lebanon

The Lebanese Green Building Council (LGBC) is a non-profit non-governmental organization founded in 2008 whose mission is to enhance sustainable construction techniques via the implementation of a national certification system. The system recognizes the building for include environmental criteria to reduce pollution and improve quality of life. In February 2012, the LGBC, in conjunction with the International Finance Corporation (IFC), introduced the ARZ building rating system. ARZ covers international environmental requirements, but also takes into consideration the specific characteristics of Lebanon, in particular energy and water conservation in existing commercial buildings, to optimize the use of resources and decrease operating costs[16, 17]. However, due to the relatively low awareness of sustainability in the country, the current state of political instability and the voluntary character of the certification, just a handful of projects have been certified so far.

2.4 Dubai Green Building Regulations – UAE

In 2011, Dubai Municipality created its own Green Building Regulations and Specifications for Dubai. Initially, it was necessary for all government projects. This rule was then extended to private developments under Dubai Municipality Circular No. 198 of 2014, effective as of March 2014. The regulations were developed in accordance with the best international standards of efficiency and were adapted to suit the particular climate and working conditions of Dubai. Its main purpose is to improve the performance of the building by minimizing the use of energy, water and materials, thereby contributing to an enhanced quality of life for the inhabitants[8, 18]. Unlike certification systems, Dubai's rules do not have tiers, but instead lay forth a common set of mandatory requirements that all new structures must meet[19, 20].

3. Achievements and Opportunities

Despite the different problems facing the region, the development and implementation of green building regulations and grading systems are major achievements, which highlight the vital role of the public sector in promoting sustainable construction. The UAE ranked ninth in the U.S. Green Building Council's ranking of the top ten green building countries outside the United States[19, 21], citing the country's focus on large-scale energy-efficient construction. The Dubai Electricity and Water Authority Headquarters achieved LEED Platinum status, and only one Middle Eastern country was represented among 140 countries with LEED projects – the UAE. This highlights the contribution private developers and architects are making in leading the way on sustainable approaches. Kuwait is also on the move with plans for the new Kuwait International Airport Passenger Terminal that is targeting LEED Gold status. The terminal has been conceived with unique design and substantial solar power generation, representing a pioneering effort in the aviation industry[3, 22]. Other landmark projects include the Masdar Headquarters and the Siemens Headquarters in Abu Dhabi, which obtained a 4-Pearl Estidama PBRs Rating and LEED Platinum certification, respectively. Thanks to intelligent building automation and energy-efficient technologies, plus a green procurement strategy, Siemens Headquarters achieved energy savings of up to 40 percent. Similarly, the Masdar Headquarters achieved 40% energy savings compared to a conventional Abu Dhabi building[23]. Recent studies further emphasize that integrating innovative thermal technologies and bio-derived materials can improve energy efficiency, economic feasibility, and environmental performance in water-related systems [47]. The region's commitment to sustainable architecture is further exemplified by the Tornado Tower in Qatar, a 200-meter-high skyscraper with an energy-efficient aluminum façade [24, 25]. These case studies demonstrate a developing sustainability consciousness in the Middle East. The countries with stable political and economic situations have achieved the most significant progress in the development and implementation of green building rules. That said, sustainable development in the built environment is still a work in progress and requires continued collaborative efforts from all involved, from government agencies to private developers and design firms[26].

4. Corporate Social Responsibility and Sustainability

Middle East's medium and large companies are increasingly adopting sustainability as a part of their corporate social responsibility (CSR) strategy. CSR, or corporate social responsibility, is often called corporate conscience. It is a company's deliberate way of making a big difference in society and the community. Traditional CSR initiatives in healthcare, education, training, employment and funding for development are being increasingly supplemented by a growing trend among Middle Eastern companies, relatively new to the region, of combining sustainability with their duties to communities. In recent years, firms have embedded sustainable practices into their operational and managerial systems as a major element of CSR. The focus on sustainability from a corporate governance viewpoint has picked up speed with strategies including green procurement, energy and water conservation, and stakeholder and community engagement[27, 28]. Effective internal auditing can reinforce corporate sustainability by strengthening accountability, evaluating environmental and social practices, and supporting more transparent organizational decisions [49]. Organizational sustainability is also influenced by internal organizational dynamics, as perceived similarity and workplace behavior may shape employees' commitment to sustainable organizational objectives [50].

4.1 CSR Case Studies

HSBC is a global banking and financial services company with an established, extensive CSR strategy defined by sustainability. The bank was also the recipient of the International Green Award for Best Green Employee Engagement (jointly with Earth Watch) and the Best Corporate Social Responsibility Financial Institution Award by the China Banking Association. The most remarkable initiative taken by HSBC was the community engagement where the company actively identified community representatives, charity partners and civil society organisations apart from traditional stakeholders to formulate sustainability initiatives tailored to local community needs[29, 30]. At the 2014 Arabia CSR Network Awards, numerous regional companies were honored for their CSR programs that combine sustainability. Emirates Transport was recognised under the Public Sector category for their CSR strategy that includes community engagement, social responsibility, occupational health and safety, and eco-friendly services. Qatar Gas was awarded the Large Business Category award for its extensive CSR framework on education, environmental stewardship, health and safety, and community development[31, 32].

5. Challenges & Limitations

The Middle East is a prime target for investment in sustainability, not just financially but also in terms of time, effort, and strategic planning. But the region faces unusually daunting challenges. These include the manmade problems and the scarcity of natural resources that impede the understanding and use of sustainable methods.

5.1 Scarcity of Water

The most immediate natural challenge could be acute water scarcity. The Middle East holds only 1% of the world's available fresh water. The climate is also mostly hot and desert. Rapid population increase, chronic poverty, and the consequent destruction of natural ecosystems further distract the government's attention from environmental issues[33].

5.2 Little Public Awareness

There is still little knowledge of sustainability and environmental challenges, even though the region is generally highly educated, with many people going on to secondary and tertiary school. Out of the four Middle Eastern countries (Egypt, Palestine, Syria and Yemen) that are in the low HDI category, the rest are in the high or very high HDI category. The Human Development Index (HDI) is a measure of education, living standards, quality of life, literacy and life expectancy of the United Nations Development Programme[34, 35]. But human development and natural abundance do not immediately translate into environmental awareness. For instance, Jordan and Lebanon

have high HDIs, yet they focus on tourism, which can frequently create negative pressure on sustainable development[36].

5.3 Political Instability

Political instability and the financial costs of conflict resolution have long plagued the region. This fact helps to create a society where the immediate needs of survival, i.e., physical security, outweigh the longer-term needs of environmental concerns. Some countries are confronted with the challenging challenge of putting sustainability first amidst ongoing geopolitical pressures[37].

5.4 Patterns of Excess Consumption

High-HDI countries such as Saudi Arabia, the UAE and Qatar are challenged to reduce overconsumption. Even with their own green building rating systems and somewhat better levels of awareness, these countries are renowned for overusing resources. Saudi Arabia's water use is 265 litres per capita per day[38-40], and the UAE's is over 550 litres[41, 42]. Both are well above the global average. This is particularly alarming as these countries use more water than many countries wealthy in surface water and renewable aquifers.

5.5 Retrofits of Existing Buildings

The advent of green building laws is progress, but a great difficulty is how to deal with the massive stock of existing built structures predating the codes. Older buildings can be retrofitted at economic cost for improved energy and water efficiency, resulting in significant operational cost savings and quick payback times. But there are still impediments, such as a lack of access to financing and low knowledge among building owners. Dubai has made significant strides with the 'Efficiency' framework, established by the Dubai Supreme Council of Energy, to decrease the energy demand of the city by 30% by 2030 [43, 44]. The region's path to sustainable development hinges on the widespread adoption of retrofitting programmes, and there is a pressing need for more initiatives of this nature.[11, 45]

6. Conclusion

Middle Eastern nations have historically demonstrated remarkable resilience in confronting both natural and human-made adversities, and their engagement with sustainability in the built environment reflects this enduring capacity. Although the concept remains nascent in certain countries, Arab states have made considerable strides ranging from governmental policy frameworks to private-sector developments. However, substantial work remains. The region must continue to mainstream sustainability across development operations and elevate public awareness. A notable impediment is the proliferation of disparate national rating systems, even as countries within the region could arguably be grouped into one or two broader categories. Given that different areas within the same country often operate under varying building permit processes and regulations, a fully unified regional code may be impractical. A more feasible step would be the adoption of a harmonized approach to green building code reform, establishing consistent baseline standards for energy, water, and environmental impact. Concurrently, raising awareness and curbing overconsumption patterns are critical if the region is to genuinely transition toward a sustainable development pathway. Ultimately, the Middle East offers promising foundations for embedding sustainability into urban development processes. While behavioral change remains a long-term endeavor, the region is undeniably on the right trajectory.

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