The notions of sustainable design and energy efficiency first entered global consciousness following the energy shortages of the 1970s and 1980s. Influenced by ideas of energy independence, many designers in Europe and North America sought ideas and strategies that could help create energy-efficient buildings and cities. As they searched for design solutions, some researched the environmentally responsive elements of traditional architecture, while others developed new solutions that employ modern technologies and high performance materials.

As the energy crisis subsided, the building industry in North America returned to business as usual, allowing its European counterpart – which emphasised technological solutions – to take a lead. But with the revival of global interest in sustainability – this time driven by both environmental and energy concerns – the dormant dialogue between the two approaches to sustainable design returned to play a role in shaping the global sustainability agenda. Oscillating between advocates of passive design and proponents of technological solutions, this dialogue continues to enrich the discourse on the future of sustainable design and development.

Regional drivers of sustainability: past and present
In the Middle East however, this dialogue took on a form that reflected the region’s climatic and socio-economic context. Like other hot and dry climates, many parts of the Middle East have a heritage of traditional architecture that featured environmentally responsive cooling strategies, a heritage that was largely ignored during the region’s colonial period. As the region transitioned into independent nation states, its post-colonial period was characterised by a strong sense of national identity and an urgent need for nation building. But this desire for development...
was undermined by the lack of local industrial and technological bases. In this challenging socio-economic context, the limited discourse on sustainable design inevitably adopted the notion of appropriate technology – a common notion at the time which suggested modern complex technologies should not be used if simpler technologies would suffice – and saw traditional architecture as an essential source of inspiration. As notions of climate change and sustainability became part of global discourse in the 1990s, they slowly found their way to the region’s national agendas. But the current forces behind the region’s sustainability agendas are different from those of the post-colonial period and are also distinct from the European and North American forces which emphasize the need to reduce carbon emissions and conserve resources while maintaining economic development and human welfare.

Instead, the education, discourse and practice of sustainability in the Middle East are driven by a convergence of pressing issues that collectively demand a more efficient and sustainable use of resources. These drivers are: high domestic energy use, diminishing water resources, a desire to demonstrate environmental stewardship and commercial development pressures. Prime amongst these forces is domestic energy use. While the region historically enjoyed an abundance of cheap subsidised energy – especially in resource-rich countries – the rapid growth of its urban centres and its domestic consumption has resulted in increasing strains on its economies and energy infrastructures. Saudi Arabia, for example, is estimated to use a third of its oil production to satisfy domestic energy needs, a ratio that is expected to rise to approximately 50% by 2030, if growing consumption patterns do not change. These rising, and even wasteful, consumption patterns are also compounded with the prospects of a peak in oil production and a strong public resistance to any reduction in energy subsidies. Thus, faced with limited policy options to reverse the consumption patterns that their subsidies have created and to avoid long term economic crises, regional policy-makers turned to energy use in buildings, given its high cost-effectiveness, and encouraged energy efficiency in residential and commercial buildings.

Equally important to energy use is water scarcity. While the region has the lowest renewable freshwater resources per capita and many of its countries rely on non-renewable aquifers or on energy-intensive desalination for their water supply, its wasteful water consumption patterns do not reflect this scarcity or the high cost of desalination. Egypt for example – which for decades enjoyed the use of two thirds of the Nile’s water – is expected to face water shortages by 2017. Abu Dhabi on the other hand, which has almost no fresh water resources, uses more than half of its domestic energy consumption in water desalination. As water crises looms, Middle East nations are beginning to reconsider their water consumption patterns.

The desire to demonstrate environmental stewardship by some governments and organisations comes next as a driver for sustainable design in the region. Governments seeking to diversify their economies, encourage sustainable development, or even gain political legitimacy, are increasingly embarking on large scale projects that adopt sustainable design. Similarly, commercially-driven developers keen on competing in the global market are increasingly experimenting with buildings that can be marketed as being green.

As might be expected, as the regional impetus for sustainability changed over the years, the dominant approaches to sustainable design have also changed to reflect this impetus. This resulted in the development of three approaches to sustainable design in the region: a revivalist approach, a progressive approach, and a hybrid approach.

The revivalist approach

As noted above, the initial discourse and practice of sustainable design in the Middle East revolved around strategies, techniques, and elements adopted from traditional architecture. This revivalist approach to sustainable design dominated the architectural discourse in education and practice and for many years appropriated all notions of sustainable and energy-efficient design.

Much of this revivalist dominance is attributed to the work of the late Egyptian architect, Hassan Fathy (1900-1989). Fathy – together with his disciples – developed an approach to sustainable design which relied on the use of local, low-impact materials and traditional environmentally-responsive design strategies such as shading, natural ventilation, evaporative cooling, thermal mass and microclimatic elements (such as courtyards). As a result of their work – and in spite of the disparity in their focus

National Commercial Bank, Jeddah (Ill. 1)
Architects: SOM
Completed in 1983, the National Commercial Bank is the largest privately owned bank in Saudi Arabia. Set in a plaza on the edge of the Red Sea, the building consists of a triangular 27-storey office tower juxtaposed with a six-storey, 400-car circular garage. The verticality of the bank tower is interrupted by three triangular courtyards “chiseled” into the building’s facade. The office windows open directly onto these courtyards with an inward orientation typical of Islamic traditional design. This provides the interiors with daylight but prevents them from overheating.

Masdar Institute, Abu Dhabi (Ill. 2; for further information, see page 19)

Al Faisaliah Complex, Riyadh, Saudi Arabia (Ill. 3)
Architects: Foster + Partners
The 240,000 m² Al Faisaliah Complex is centred around Saudi Arabia’s first skyscraper – a 267-metre-high office tower – alongside a hotel, a conference centre, luxury apartments and a three-storey retail mall. Square in plan, the office tower is designed around a central core which tapers to a point, with four main corner columns defining its silhouette. The facades are clad in silver-anodised aluminium panels with cantilevered sunshading. Above its 30 office floors, the tower houses a restaurant set within a golden glass sphere 200 metres above ground level.

Karin Elgendy is an architect and sustainability consultant based in London. His research and consultancy work focuses on sustainable design and development in the Middle East. He is also the founder of Carboun, an advocacy initiative promoting sustainability and environmental conservation in the Middle East.
on energy efficiency and their ability to apply these strategies successfully - they were collectively credited with reviving long forgotten traditional knowledge. Their approach to energy-efficient design, however, was characterized with a number of flaws that proved detrimental to their success. These flaws include the formulaic use of traditional design elements; an exclusive use of appropriate technology that bordered on rejection of modern technology; a prescriptive use of low comfort levels; and a ‘master architect’ approach to design that failed to seek essential interdisciplinary collaboration.

Thus, in spite of the revivalists’ claims that their designs were as environmentally-responsive as traditional architecture – and are therefore inherently energy efficient, the performance of their built projects – such as the New Bariz Village Market in Egypt’s western desert and the Kafr Elgouna Resort in Hurghada – failed to live up to the ideals they espoused. So with the advent of the global sustainability movement, the role of the revivalists in practice diminished, giving way to the emergence of two new approaches, a progressive approach and a hybrid approach.

The progressive approach
Practitioners of the progressive approach seek to use the latest technologies to achieve energy-efficient buildings, a design approach that is diametrically opposite to the revivalist approach. Progressives appear to be more concerned with technology transfer than appropriate technology and have almost no interest in lessons learned from local traditional design. To achieve their energy targets, their designs rely on shading and technologies such as high-performance glazing, efficient cooling systems, and integrated renewable energy systems. As such, they are largely dependent on foreign industrial bases to supply solutions for local and regional design challenges. Their subscription to narrow comfort standards has also minimised their passive design options by encouraging ‘sealed-envelope’ designs and by excluding strategies such as natural ventilation.

A limited number of buildings that belong to this approach emerged over the last 20 years around the Gulf region. Most prominent amongst which is the World Trade Center tower in Bahrain (by Atkins), which incorporates three large wind turbines, and the Al Faisaliah Tower in Riyadh (by Foster and Partners), which features high performance facades and complex and efficient cooling systems. Affiliated with this approach is also the National Commercial Bank in Jeddah (by SOM) and the plethora of unbuilt schemes that emerged in the years preceding the recent economic downturn. These unbuilt schemes, such as the DIFC Lighthouse Tower (by Atkins) and Burj Al-Taqa in Dubai (by Gerber Architekten), have all promised great energy performance through a mix of efficient cooling and lighting sys-
tems, and on-site renewable energy generation. The emergence of this approach coincided with a predominant lack of understanding of sustainable design amongst local design professionals. This lack of sustainability knowledge prevented them from taking a leading role in the design process in spite of their local knowledge, which created a vacuum for foreign – and especially European – designers to fill. As a result, projects that belong to this approach often appeared to emulate the European approach to energy-efficient design. Not only do their designs emphasise building envelope and efficient active systems, but they also appear to adopt design strategies such as extensive glazing that were developed for colder climates and even subscribe to European high-tech aesthetics.

This imported nature of the progressive approach raises concerns not only regarding its appropriateness to the region’s climate, but also regarding the general sustainability of reliance on imported technologies and the practicality of maintaining imported systems.

The hybrid approach
As its name indicates, the hybrid approach represents an attempt to combine the revivalist and progressive approaches. As a fairly new approach that first appeared in the early years of the twenty-first century in the UAE, Egypt and Jordan, it promises to be the most balanced of all three approaches. Its advocates claim to combine principles learned from traditional architecture with modern technologies to reduce the environmental impact of development while maintaining acceptable comfort levels. Practitioners of the hybrid approach often combine the use of passive ventilation and cooling strategies with the need to maintain thermal comfort throughout the year.

Buildings that belong to this category, for example, balance the use of shading and thermal mass with envelope insulation, and balance natural ventilation – using elements such as wind towers and solar chimneys – with the use of efficient cooling systems, as is the case in the King Abdullah University for Science and Technology (by HOK), the new campus of the American University in Cairo (by Community Design Collaborative, Sasaki, and others) and the Masdar Institute for Science and Technology (by Foster and Partners). Water use has also been given its due attention in this approach with water conservation measures becoming an integral part of its design strategies.

Advocates of this approach are also distinct in their attitude towards the role of renewable energy in design. Unlike the revivalists, who generally steer away from renewables, and the progressives, who often place renewables at the heart of their sustainability strategies, the hybrid approach practitioners have adopted a balanced approach towards renewables. Armed with...
the now-common knowledge of the relative cost effectiveness of energy efficiency measures, they consider renewables as a last resort measure to be used after exhausting the use of passive design strategies and efficient active systems. Such notions of combining passive strategies with efficient systems and renewables and using adaptive comfort models may suggest that this approach merely represents a local manifestation of the direction in which global sustainable design is currently heading. However, the local design solutions produced by this approach in response to its climate and socio-economic context asserts its distinctly regional nature. In addition, the hybrid nature of this approach has often necessitated a collaboration between local and foreign designers to combine local knowledge with global expertise. This dialogue occasionally facilitates knowledge transfer and supports the development of a generation of local design professionals that understand sustainable design in their local context.

The regional players
As varied as the approaches to sustainability are, as is the nature of the stakeholders pushing its agenda forward. This variety in players reflects the political and socio-economic realities of the countries in which they operate. In countries where there is a relatively strong civil society such as Jordan and Lebanon, sustainability has been championed by NGOs and professional associations, who work at grassroots level to create awareness, build organisations such as green building councils and empower professionals through education. In countries with strong central bureaucracies, on the other hand, players tend to emerge from within the government’s research and educational institutions. Egypt represents a prime example of this category, where its green building council forms part of a government body and its efforts to promote sustainability focus on developing policy and enforcement measure such as energy efficiency standards and rating systems. Between these two extremes lies a variety of conditions. These conditions include professionals establishing green building councils in parallel to governmental efforts to develop energy codes, as is the case in Dubai, Saudi Arabia and Morocco. They also include combinations of government-backed and commercially-backed organisations as is the case in Qatar and Abu Dhabi.

In the Qatari case, the government funded Green Building Council acts as an advocate for sustainability while the commercially funded, Gulf Organisation for Research and Development develops and promotes a green building rating system. Similarly, the Estidama initiative in Abu Dhabi was created by the municipal Urban Planning Council to develop sustainable design guides and a mandatory rating system. Simultaneously, the government supported the creation of commercial entities such as the Masdar Initiative, which acts as a catalyst for sustainable development through its investments in renewable energy and pilot projects. These pilot projects include the master plan for Masdar City and a number of key buildings planned for its centre. But while the government-backed Masdar Initiative is a regional leader, it is certainly not alone in investing in sustainable design. In recent years, several institutions have invested in creating excellent examples of sustainable design. These examples include higher education campuses such as the American university in Cairo, the American University in Beirut and the King Abdullah University for Science and Technology. They also include schools such as Lycee Charles De Gaulle in Damascus and a small number of civic buildings, residential developments and private residences.

While the list above may suggest that sustainable design has spread into many sectors around the region, it also suggests that its manifestations remain limited not only quantitatively, but also qualitatively to high profile clients for whom financial return is not the only concern. This is evident in the lack of examples from profit-driven developments such as commercial offices and hospitality facilities, or from cost sensitive projects such as medium to low cost housing. Notwithstanding the recent interest in social sustainability around the Middle East and despite research efforts to combine sustainable design with low cost housing in Egypt, not one project has yet emerged that addresses large scale housing or successfully integrates sustainable design within a local economic and social sustainability agenda. These observations raise questions on the viability of sustainable design in the region and suggests that there are challenges preventing it from becoming part of mainstream industry and design practice.
Regional challenges
As one might expect, the region’s environmental challenges are at the top of this list of challenges. Since moderating indoor environments effectively in this challenging climate requires a substantial reduction in heat and solar gain and an optimisation of cooling, sustainable design here often requires a combination of passive and active cooling strategies to achieve acceptable comfort levels. This combination often creates ‘radical’ designs that pose additional programmatic and cost challenges, and occasionally produce design forms that are unwelcome by some developers and occupants in the region. Integrating a mixed-mode ventilation and cooling strategy, for example, has associated capital costs that might not be appropriate for every project’s funding model. Similarly, while it is an established fact that in order to reduce solar heat gain it is preferable to limit the use of glazing, many developers and occupants are unwilling to accept any design form that does not feature excessive glazing. As a result, it has become common for design teams to abandon their ambitious sustainability aspirations during the design process, occasionally resigning themselves to the use of standard mechanical systems.

There are also economical challenges to sustainable design, with energy subsidies that act as a disincentive for energy efficiency and a construction industry that is reluctant to adopt sustainability standards due to its concerns about supply chain changes and increased capital costs. Challenges also exist within the design process. Confusion amongst local designers on which sustainable design approach to adopt, coupled with a lack of region-specific knowledge in architecture education, and consequently amongst local design professionals, has prevented local designers from taking a leading role in the sustainable design process. But while these challenges may appear daunting, the varied efforts taking place in the region may indicate that the tide is turning – albeit slowly – towards sustainable design in the Middle East. An increasing collaboration with foreign architects, coupled with a recent interest in sustainable design amongst young professionals, indicate that knowledge-related challenges are likely to be overcome in the short to medium term.

Similarly, as the region continues developing the hybrid approach to design, and as its industry continues streamlining its practices, adopting energy efficiency standards and creating new supply chains for sustainable materials, additional capital costs are likely to diminish, paving the way for the savings from reduced energy and water use to act as financial incentives. Finally, as the region’s current state of political flux stabilises, it is hoped that its states would find their steps towards sustainable development policy, accelerating the pace of change, and ultimately creating cleaner and greener cities for the region and a more sustainable future for its people.

King Abdullah University of Science and Technology, Thuwal (ill. 10-12)
Architects: HOK
The new university in Thuwal, around 80 km north of Jeddah at the Red Sea, took only three years to plan and construct. To date, it is the largest certified LEED Platinum building complex worldwide. The buildings, which stand in close proximity next to one another, share a common roof, shading each other while also providing shade to the open spaces between the buildings. Two wind towers use solar radiation to improve the air circulation in the circulation spines between the buildings. A photovoltaic and a solar thermal facility on the roofs provides nearly 8% of the energy required by the university. A further 70% of energy is covered by green electricity.

Masdar Institute, Masdar City, Abu Dhabi (ill. 13-15)
Architects: Foster + Partners
Once completed, Masdar City, the world’s first zero energy city, is expected to accommodate 50,000 permanent residents and a daytime population of 90,000. The first part of the Masdar Institute of Science and Technology, completed late in 2010, comprises a library, laboratories and student housing. The four-storey structure uses passive methods of cooling and ventilation whenever possible. Thermal mass was used where it makes sense – such as in the concrete construction of the student housing – and omitted where it does not, such as in the envelope of the laboratories block, which consists of thermal insulation covered with a thin ETFE foil.