

that link (to some extent) the costs of blue water utilization and stewardship been installed for irrigated farming. Some regions in the south-west of the USA, northern China, Central Asia, and the MENA might be forced to embark on similar paths in the near future due to aggravating drought, water scarcity, and exponential growth of competing water utilization in non-agricultural sectors. The OECD expects freshwater consumption to grow by 55 per cent between 2000 and 2050, with the growth in manufacturing (400 per cent) and electricity generation (140 per cent) particularly high.

Nexus-related policy areas

Against this backdrop the following nexus-related policy areas will be of importance in MENA countries:

The reduction of hydrocarbon energy subsidies, which are among the highest in the world, disproportionately benefit the middle and upper classes and favour capital-intensive production technologies that are less likely to absorb the region’s burgeoning youth population into labour markets.

At the same time the region might want to consider *shifting some of the hydrocarbon subsidies into the support of renewable energies like solar*, that offer diversification potential and have less negative environmental externalities. Capital transfers by Gulf development funds to poorer MENA countries could prove beneficial in such strategic reallocations towards green growth initiatives.

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The MENA’s dependence on food imports will grow while the current global food system is unsustainable.

Engagements with international organizations and global supply chains to ensure greater environmental sustainability should be in the best interest of MENA countries. Yet its institutional capacities to do so are underdeveloped. Food subsidies are self-targeting and disproportionately benefit the lower classes. Their reduction is less likely, but subsidy reform might prove possible if better targeting, via smartcards, is undertaken or compensating financial benefits are offered to vulnerable segments of the population.

Water consumption is unsustainable in the MENA and hugely inefficient.

Water will need to be (better) priced and the role of farmers will need to be upgraded to ensure better water stewardship. In many ways, water is a public good that requires functioning ecosystems, and government regulation to preserve them. However, greater irrigation efficiency might lead to increased water consumption, if such gains are used for production expansion, as has happened in Morocco and Israel. Ultimately, some reduction of agriculture might be necessary to

funnel scarce blue water resources into economic sectors that create more value added and employment – like industries and services. About 90 per cent of rain water in dry marginal areas is lost to evaporation. However, even if blue water resources in the MENA are overallocated, its green water resources are underappreciated and offer considerable potential for improvement – such as better management of rangelands, water harvesting and supplementary irrigation, and the development of seeds that better withstand drought and soil salinity.

No formal agreement about the sharing of transnational water resources exists in the MENA. While hydrogeopolitics along the Euphrates, Tigris, Nile, and Jordan attract a lot of media attention, and rightfully so, groundwater depletion has developed into an even more pressing issue in countries like Syria, Iraq, Yemen, the Gulf, and Jordan.

At their core, the MENA’s challenges of administering water, energy, and food supplies are often closely interrelated and merit greater coordination across political institutions. Rather than following top-down approaches, these institutions would need to cooperate more with actors along the value chain and with civil society in general. A more open political environment, with more empowered mid-level institutions and possibilities for association from below, would be more conducive to such efforts.



Climate change and green policy in the UAE

Nivine Issa and Phillipa Grant

Climate change is an increasingly important consideration in the UAE. The growing impact of climate change

has been particularly apparent through precipitation changes, rising sea levels, and more obvious climatic

fluctuations such as harsher summers and cooler winters. According to a document (*Climate Change Impacts,*



Vulnerability and Adaptation) produced by the Abu Dhabi Environment Agency in 2009, the UAE is already subject to extreme weather conditions – even small variations in temperature and precipitation could negatively affect the country’s fragile natural resources and its strength to adapt. The uncertainty and unpredictability of climate change in the region, together with its non-quantifiable effects, have urged the UAE to push ahead in the sector of sustainability, ahead of many of its neighbours.

In 2008, a national study (reported on the website of the Emirates Nuclear Energy Corporation (ENEC) in the document ‘Nuclear Energy in the UAE’) was conducted into the country’s growing energy and electricity demand. It determined that the UAE’s electricity generation needs will exceed 40,000 Megawatts by 2020 – an annual rate of increase of 9 per cent, which is three times the global average. With its existing generation capacity, the country will not even be able to meet half of this demand; therefore, it is faced with an urgent need for policy planning and exploring alternative sources of energy.

In consequence, the UAE has approached the energy sector from both ends of the spectrum: *supply management* by exploring alternative sources of energy and *demand management* by reducing energy demand and improving efficiency. This article synthesizes the way in which the UAE tackles the subject of sustainability in the energy sector, how this ties in to the growing energy demand, and the challenge of meeting demand with sustainable policy planning through green building codes, energy efficiency, renewables, and nuclear energy.

Green building codes

In response to rising energy demand and its consistently growing population,

the UAE has made energy demand management strategies (specifically through sustainable policy planning) a central pillar of its long-term economic planning. As part of its 2030 Plan, Abu Dhabi’s Urban Planning Council (UPC) established sustainability at the core of its vision; with the unveiling of the Estidama Pearl Rating System in 2009, the Emirates’ vision of promoting sustainable urban development came to life. The Estidama rating system (applicable to buildings, communities, and villas throughout the processes of design and construction) has been tailored to the specific conditions and needs of the region and allocates significant weighting to water and energy conservation.

The UPC made Estidama a mandatory step in the process of acquiring a building permit, from its inception in 2009. The minimum 1-Pearl rating has been set as a target for all private developments, while a further commitment to green building has been set for government projects by mandating a 2-Pearl rating. Estidama has proven efficient and effective at reducing the energy demand of new buildings in Abu Dhabi through holistic planning and sustainable design. In fact, energy credits guide design teams towards passive design measures (such as building orientation and maximized shade), an efficient building envelope and mechanical systems, in addition to reduced electrical loads.

Likewise in Dubai, in 2011 the Dubai Municipality, in collaboration with the Dubai Energy and Water Authority (DEWA), released its own green building regulations and specifications; this is a set of guidelines with which all developers are to comply. In fact, unlike Estidama and the Leadership in Energy and Environmental Design (LEED) system mentioned below, the Dubai Green Building Code is not a multi-tiered rating system but a list of

regulations that has to be implemented in all new developments.

There has also been a significant voluntary uptake of the LEED rating system – which certifies buildings against a set of sustainability criteria – by the country’s private developers. The UAE has witnessed rapid growth in the adoption of sustainable design principles as developers, owners, and design firms have adopted the above green building codes; this has increased overall awareness and investments in ‘green’ products. In fact, the U.S. Green Building Council (USGBC) recently ranked the UAE eighth in the world for having a cumulative LEED-certified Gross Floor Area (GFA) of 3.13 million square metres.

Dubai’s Integrated Energy Strategy 2030

Another integral part of national policy planning, the Dubai Supreme Council of Energy, has released Dubai’s Integrated Energy Strategy of 2030; this aims to reduce the emirate’s energy demand by 30 per cent and diversify energy sources to include gas, nuclear, solar, and clean coal by 2030. Buildings are considered to have the largest potential for increases in energy efficiency, therefore reducing demand.

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It does not suffice to set targets for new buildings, however, existing targets should also be revisited to curb rising energy demand. As described in the ‘State of Energy Report – Dubai’ (produced in 2014 by the UNDP), the Regulatory and Supervisory Bureau (RSB) plans to nurture and support the ESCO market as it represents a promising solution to the country’s retrofitting needs. An ESCO is an Energy Service Company that offers

performance-contracting services; these allow building owners to make necessary improvements to an existing building with little or no initial investment. Through installing energy-efficient equipment, and maintaining existing machinery over the duration of the contract, the building owner achieves cost savings by reducing consumption over a period of, typically, five to ten years.

In fact, in early 2014 the Dubai Energy and Water Authority helped to establish the first large-scale super-ESCO in the region: Etihad Energy Services. Its key role as an organization is to form an interface for energy efficiency projects, through financing them and subcontracting ESCOs for project implementation.

Energy Supply Management

A one-sided approach towards the reduction of energy demands is not sufficient to meet the demands of a growing population and a booming economy in a sustainable manner. This is why the UAE has also invested substantial effort in the development of alternative sources of energy.

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‘... SOLAR HAS EMERGED AS THE PRIMARY RENEWABLE ENERGY MARKET WITHIN THE UAE.’

Solar. As expected, solar has emerged as the primary renewable energy market within the UAE. The Research Centre for Renewable Energy Mapping and Assessing (RCREMA), part of the Masdar Institute Research Centre, has developed a Solar Atlas for the UAE (available on the Masdar website), whereby satellite imagery has been utilized to develop a map of solar potential across the UAE. The need for this map arose from the high demand for solar power and the search for suitable PV sites.

The results of this study proved the existence of high yearly variability in solar irradiation in the UAE. Figures for direct, diffuse, and global horizontal irradiation varied between 1800–2200, 750–900, and 2100–2300 kWh/m² respectively, over the course of the three year period 2008–2010, for the UAE region. With this significant energy resource available, solar energy has been embraced on a commercial and residential scale. Notable solar installations include the solar fields at Masdar City – which include the Concentrated Solar Power (CSP) installation Shams 1, and the Masdar City Solar PV plant – in Abu Dhabi, and the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park in Dubai.

According to the Masdar website Shams 1, located in western Abu Dhabi and completed in 2013, has emerged as one of the world’s largest CSP projects. With a total area of 2.5 km² and an installed capacity of 100 MW, it has the capability to provide power to more than 20,000 local homes. Shams 1 utilizes Concentrated Solar Power (CSP), as opposed to the popular photovoltaic (PV) systems, and is connected directly to the grid.

Masdar City’s other solar field, the Masdar City Solar PV plant, is currently the largest solar PV system in the UAE. The plant occupies an area of 210,000 m² and has an installed capacity of 10 MW. This generates 17,564 MWh annually.

According to the 2015 report ‘Solar Energy in Dubai Mohammed Bin Rashid Al Maktoum Solar Park United Arab Emirates – Dubai’ produced for the Dubai Electricity and Water Authority by the Middle East Solar Industry Association (MESIA), the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park will be constructed and operated in stages, with the final stage expected to complete

by 2030. The total area of this solar park is planned at 40.45 km² with an installed capacity of 1,000 MW. It will utilize the more conventional PV technology and is managed and operated by DEWA. The most notable characteristic of the project is that it is based on the Independent Power Producer (IPP) model; this has resulted in unprecedented competitive pricing, constituting the world’s lowest price to date (by a significant margin) for solar PV energy.

As for residential solar power, the market has been relatively slow to date, with little impact on the overall energy markets. In March 2015, DEWA announced the introduction of their smart initiative ‘Shams Dubai’, with the aim of encouraging personal residential solar power installations by allowing connection to the grid under the net metering system.

There are also solar hot water systems within the UAE, and they are now mandated for certain residential developments. The fast returns on investment, together with their relatively simple technology, have led to a fast uptake of the systems in rooftop applications.

Nuclear. In 2008, the Emirates Nuclear Energy Corporation (ENEC) published the UAE’s Nuclear Energy Policy, under the title ‘Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy’, emphasizing standards for safety, transparency, and security. The six key principles covered by the policy include:

- complete operational transparency;
- the highest standards of non-proliferation;
- the highest standards of safety and security;
- working directly with the International Atomic Energy Agency (IAEA) and conforming to its standards;



- partnerships with responsible nations and appropriate experts; and
- long-term sustainability.

Based on this Policy, in 2009 a UAE Federal Law was signed regarding the peaceful uses of nuclear energy, an independent federal agency the Federal Authority of Nuclear Regulation (FANR) was established, and systems allowing the development of nuclear materials were enabled. With a target of 25 per cent of the UAE's energy requirements to be provided by 'clean' energy, the first nuclear reactors have commenced construction in the western region of Abu Dhabi, with the first unit expected to complete in 2017 and all four units to be completed by 2020 (the ENEC website gives a useful summary of the key dates).

The evolution of the 'Green' Market

The rapid growth of the green market in the UAE has come hand-in-hand with the aforementioned drivers, legislation, and initiatives, as the demand for 'green' products and services keeps rising – creating countless opportunities in the economy.

For instance, as reported in the article 'UAE solar sector heating up with 1,000 new jobs expected' by LeAnn Graves on 19 May 2015 in *The National*, MESIA has estimated that around 1,000 jobs will be created within the UAE solar industry in the next two years.

Furthermore, also in *The National*, it was reported on 18 January 2014 (in the article 'UAE renewable energy projects bring the future into view' by Dania Saadi) that the online service MEED Projects had analysed the current total value of renewable energy projects and master plans, either

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'THE UAE ... EMERGED AS REGIONAL PIONEERS IN THE RENEWABLE ENERGY AND SUSTAINABLE BUILDING SECTOR OVER THE PAST DECADE.'

operational or under construction, in the GCC region at an estimated US\$4.5 billion. Projects to the value of US\$1 billion are located in the UAE, making the UAE the current largest contributor to the GCC renewables market. Between now and 2025, from the number and value of renewable projects awarded, the total estimated value in the GCC region is expected to increase to US\$162 billion.

As for 'green' products, it has been particularly noticeable that suppliers of building materials have been capitalizing on 'green-er' products, such as more efficient architectural, HVAC (heating, ventilation, and air conditioning), and electrical materials as well as more environment-friendly interior design products. This change has been specially reinforced with the implementation of the green building codes that created a substantial increase in demands for green products.

Looking to the Future

The UAE have much to be proud of through their successful infiltration of the international green market, having emerged as regional pioneers in the renewable energy and sustainable building sector over the past decade. The timeline below illustrates the key milestones and intensive activity within this industry since 2008, emphasizing the effort that the UAE has invested in energy supply and demand management. However, as with every success story, there are still areas to be

improved on and developed.

Within the new sustainable building sector, the greatest barrier to efficient and successful projects undeniably lies within professional understanding and education. Since the introduction of sustainable building legislation, there has been a definite and consequential improvement in quality, efficiency, and life expectancy of developments; however, the major factor hindering this improvement is the lack of understanding and expertise among construction professionals. This has been slowly but effectively improving as a result of governmental, private, and national initiatives and investments.

Another significant barrier to the achievement of the UAEs' energy efficiency targets is the lack of community engagement, as a key factor in the success of these targets is the public's understanding and contribution. An energy-efficient building operated by an immoderate and uninformed population can be more detrimental than beneficial. Schemes such as DEWA's 'Green Footprint Initiative' in Dubai are aiming to increase community engagement through the education and involvement of the public. DEWA has started including the 'Green Footprint' symbol on customers' energy bills, to raise awareness of the scheme; this involves including information on the carbon footprint of energy-consuming activities, as well as steps people can take to reduce their energy consumption, and subsequently their individual carbon footprint. From a country known worldwide for its oil production and energy-intensive construction industry, this transformation of the UAE within the international 'Green Community' is quite remarkable.

