and CO_2 emissions (see the author's OIES working paper 'The International Relations of the Green Economy in the Gulf'). It is argued that the concepts of green growth and green economy can offer tools for reconceptualizing energy as an engine for innovation and a sustainable source of prosperity for the GCC states.

A greener economy in the Gulf?

Green growth and green economy are opportunities-oriented approaches, in that they focus on possibilities, not limitations. The former is a tool to get to the latter. A key distinction is that green growth alone does not suffice for a green economy transition if 'brown growth' occurs at an equal or faster pace. In addition, for a truly green economy, countries also need to 'green the brown' by transforming existing infrastructure and natural resource consumption patterns to more sustainable ones.

As concluded in a recent volume *The Green Economy and the Gulf*, co-edited by Mohamed Abdel Raouf and the author of this article, great opportunities exist for the GCC states to green their investment and infrastructure in various sectors, including energy, water, buildings, and transport. Green jobs, trade, and aid also present huge opportunities. In the book, 18 authors examine key aspects of a green economy in the six GCC states, identifying barriers and opportunities, and drawing lessons and best practices from other countries. Barriers to greening are often linked to a broader socioeconomic context, and therefore require comprehensive and context-sensitive solutions.

The UAE's recent decision to begin deregulating transport fuel end-user prices is a great example of such a potential solution: well-timed (given the low level of global oil prices) and gradual enough to allow for consumers to start adapting to the idea that the time of under-priced energy is over.

Benefits of green economy policies for the GCC governments are numerous. Energy and water pricing reform, efficiency and performance standards, effective environmental regulation and enforcement, and integrated urban planning can generate important economic savings in the long term. Investing in green sectors, such as renewable energy or green buildings, can generate jobs, as can regulatory and policy frameworks geared at encouraging private-sector participation in green industries.

By fostering growth that is green and devising innovative and context-relevant solutions for 'doing more with less', the GCC states will position themselves as competitive players in the twenty-first century global economy. Green growth and international collaboration will both be key tools for achieving this.

**The views expressed in this article are those of the author, and do not necessarily reflect the views of the Emirates Diplomatic Academy or the UAE Government.*

The water–energy–food nexus in MENA

Eckart Woertz

The Middle East and North Africa (MENA) is the world's largest oil exporting region. It is also its largest importer of cereals, poultry, and sugar and one of its most arid regions. Its role in global energy and food markets is pivotal. In contrast, no comparable global market for water exists as 'blue water' (water in lakes and rivers, together with ground water) is a bulk commodity that is not very suitable for long-distance transportation. Yet via its food trade, the MENA imports huge quantities of 'virtual water' (water that was used to produce a commodity and is hence embedded in it). Virtual water trade has added the equivalent of a second river Nile to the water balance of the region and is the *conditio sine qua non* of its food security, as it had already lost the ability to produce all its required food from renewable water resources in the 1970s.

'WATER, ENERGY, AND FOOD ARE LINKED ON MANY LEVELS AND UTILIZATION OF ONE ITEM OFTEN CARRIES OPPORTUNITY COSTS FOR ANOTHER.'

Water, energy, and food are linked on many levels and utilization of one item often carries opportunity costs for another. Water is needed for the production of food, biofuels, and unconventional natural gas and for the cooling of power plants, but it can also produce energy itself via hydropower. Water systems in turn consume copious amounts of energy for pumping, desalination, irrigation, and treatment. Not only is agriculture the world's largest user of water by far, it also became increasingly dependent on hydrocarbon inputs in the twentieth century– spurred by mechanization, the globalization of supply and distribution chains, and the invention of the Haber–Bosch process (enabling nitrogen fixation and the production of mineral fertilizers). If deforestation,

distribution chains, fertilizers, and agricultural mechanization are considered, the global food system is the most potent emitter of greenhouse gases, comprising up to 29 per cent of the total. Climate change and environmental backlash in turn could compromise the agricultural production growth that is crucial to feeding 9 billion people by 2050.

The various interlinkages between water, energy, and food have led to attempts to conceptualize all three in one methodological approach – the Water–Energy–Food (WEF) nexus. Like its predecessor – Integrated Water Resources Management (IWRM) – it grapples with methodological issues of measurement, operationalization, and implementation and can mean different things for different people. However, it has been rather more in evidence at academic conferences than in politics.

Moves towards an integrated approach

In 2008, the World Economic Forum identified water, food, energy, and climate change as interrelated issues that should be tackled with an integrated approach. The German government followed suit in 2011 and organized an international conference on nexus-related issues, in an attempt to highlight Germany as an international champion of sustainability strategies. Yet transforming theory into policy making has proved to be elusive. Governments tend to address challenges in each sub-sector individually, although there have been attempts at bureaucratic unification. Morocco has integrated its ministries of energy, mining, water, and the environment into a single ministry. Saudi Arabia stripped the water portfolio away from the Ministry of Agriculture and put it into a separate Ministry of Water in 2001. In 2004, it added electricity to the latter's portfolio, making it the Ministry for Water and Electricity, in the hope of facilitating better management of the intertwined generation of power and desalinated water.

A number of MENA countries have sought to increase the efficiency of natural resource utilization via green growth initiatives, such as the expansion of renewable energy production in the Gulf, Morocco, and Egypt. Gulf countries have established bespoke institutions – like Masdar City and the International Renewable Energy Agency (IRENA) – which are based in Abu Dhabi or the King Abdullah City for Atomic and Renewable Energy in Riyadh. Local governments are interested in enhancing their international standing via such highly publicized initiatives, yet upon closer scrutiny renewable energy targets are limited and are still dwarfed by lavish hydrocarbon subsidies. Abu Dhabi hopes to use renewable energies for 7 per cent of its installed power generation capacity by 2020; however this boils down to only about 2.5 per cent of actual electricity generation if the relatively low degree of capacity utilization of intermittent renewable sources like solar power is taken into consideration. This number is hardly earth shattering or ambitious; reining in runaway demand would offer much larger reductions in greenhouse gas emissions, but local regimes are reluctant to tackle this issue due to political concerns.

'AFFORDABLE FOOD, WATER, AND ENERGY ARE CRUCIAL FOR POLITICAL LEGITIMACY.'

Affordable food, water, and energy are crucial for political legitimacy. All three are highly political commodities and so is their nexus, yet nexus approaches tend to be informed by technocratic mindsets of engineers and economists who hope to find ideal technical fixes and allocation functions, while underestimating the importance of politics. The only political concept that enters their way of thinking is that of 'governance', a perceived standard of appropriate administration that is called upon to implement 'solutions' that have been 'objectively' identified. Yet politics is different from governance; it entails winners and losers and it is used to cement the prevailing elite narratives of development and legitimacy. As such, nexus narratives are hardly new and have not been invented by the World Economic Forum. In the case of Egypt, the hydraulic mission goes back to Muhammad Ali 200 years ago. Consecutive Egyptian elites have been well aware of the interconnections between water utilization and food and energy production, and have used nexus narratives to justify rent seeking, influence peddling, and attempts to attract foreign capital.

Issues associated with MENA's energy demand

The MENA's domestic energy challenges are by now well established. In contrast to earlier periods, the region is not only the world's petrol station, it has also become its own best customer. Population and income growth together with lavish hydrocarbon subsidies fuel demand. The same is true for some food products and water provision. Related subsidies are part and parcel of the social contract of rentier and semi-rentier states in the region. It is difficult to unravel them or change their direction. In so far as reform has been undertaken, energy subsidies have been first in line, for example in Egypt and Kuwait. Not only are such subsidies much larger than those on food, they also disproportionately benefit the middle and upper classes that own cars and electrical appliances. In contrast, food subsidies are self-targeting, as poor people spend a relatively high share of their income

on food. However, reductions in energy subsidies have already caused increased food prices because of the fuel needs of production and distribution processes.

Energy subsidies have also benefitted industrial producers, encouraging energy-intensive production processes, like Egypt's steel industry, in particular. However, in the Gulf states, the competitive advantage formerly enjoyed by heavy industries that relied on cheap natural gas as feedstock is now under pressure, as every country except Qatar now faces a natural gas shortage and alternative energies will likely come with a higher price tag. This will also affect the pumping of groundwater for agriculture and the production of desalinated water, which forms the bulk of residential water supplies.

Increasing awareness of the value of water

While farmers have used non-renewable fossil ground water for irrigation purposes, aquifers run dry, and in 2008 Saudi Arabia started to phase out its subsidized wheat production – by 2016 it will rely solely on imports. Similarly, the UAE is phasing out the water-guzzling production of Rhodes grass for its livestock sector. Improvements to irrigation systems offer great potential, as in many cases inefficient flood irrigation still prevails. Yet a word of caution is in order. In Morocco and Israel the introduction of drip irrigation has led to *increased* water consumption, as the efficiency gains were used to expand agricultural production. Ultimately, some degree of rationing and reduction of agricultural activity might be unavoidable. The fact that the population in occupied Palestinian territories only gets a fraction of the water allocation of Israeli citizens also illustrates once more the political nature of resources management that fails to be addressed by mere technical approaches.

If the negative externalities of the energy and agricultural sectors, in the form of emissions, have been ignored, the positive externalities of water have been taken for granted. It has been regarded as an essentially free commodity for a long time. Water is different from other commodities due to various characteristics such as its bulkiness, low tradability, and heterogeneous demand patterns that encompass vastly different categories (residents, industry, farmers, and those – such as 'the environment' and the poor – who are unable to pay). Substitutability of water is limited, and it is essential for human life. Hence it has low excludability and governments play a prominent role in its management, even in the cases where blue water provision is privatized. In many ways water is a public good rather than an economic good. This is even more apparent if one goes beyond the localized provision of blue water supplies for residential consumption and irrigation. Water is recycled through the atmosphere, not locally. It is crucial to take the complete hydrological cycle into consideration and the provision of water by functioning ecosystems, especially as about 70 per cent of the world's crops are not irrigated, but grown with green water (water encapsulated in the soil as a result of rainfall).

'GOOD STEWARDSHIP OF WATER WILL REQUIRE GOVERNMENT REGULATION AND THE PARTICIPATION OF FARMERS.'

Good stewardship of water will require government regulation and the participation of farmers. Agriculture withdraws the vast bulk of water resources – the global figure is around 70 per cent, but in the MENA it can reach 80 per cent. Its share in *consumptive* water use is even higher (around 92 per cent), as evapotranspiration of plants is a one-off occurrence in each hydrological cycle, while residential and industrial withdrawals can be recycled or used twice (for example, water used for cooling a power plant can be used downstream for something else).

The importance of value chains

Value chains in energy, water, and food provision are crucial in managing water supply. Energy value chains are much more concentrated in the upstream sector than food, where one finds half a billion farmers globally. Although some MENA countries are largely urbanized, the rural population still represents a large minority in some of them (such as Syria) or even the majority (Egypt, Yemen). Farmers are crucial in the value chain for food provision and they are by far the largest consumers of water, yet they are disempowered. The global food system is heavily concentrated on the functions of procurement and distribution.

Food trading houses and food processers have considerable contractual leverage over farmers, who manage most of the water, but there has been limited incentive or awareness in these parts of the value chain to engage with the farming sector for better water stewardship so far. Mostly they communicate with the agricultural upstream sector via contracts that ignore or misprice water and its economic externalities. Reporting systems are underdeveloped and accounting rules absent. An economics textbook wisdom – that worships GDP growth as a panacea and an unquestionable assumption, while ignoring and underestimating negative externalities of such growth – prevails.

Only in some semi-arid OECD countries, such as Australia or Israel, have tariff and market arrangements

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.

'THE MENA'S DEPENDENCE ON FOOD IMPORTS WILL GROW WHILE THE CURRENT GLOBAL FOOD SYSTEM IS UNSUSTAINABLE.'

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 hydropolitics 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,*