



This project is co-funded by
the European Union



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The Water-Energy-Food Nexus in the Arab Region

Nexus, Resource Efficiency, and Sustainable Development

Summary

Reliable water, energy, and food supply are inextricably linked in the Arab region, perhaps more than any other region in the world. Generally, the region is energy rich, water and land scarce, food deficient, and one of the most vulnerable regions in the world to the potential adverse impacts of climate change. The current water-energy-food-climate policy landscape in the region is complex and fragmented; they have been developed independently of each other. The current low pricing policies of resources in the majority of Arab countries have been promoting unsustainable consumption and production patterns leading to more resources depletion. Low pricing and across the board non-targeting subsidies have resulted in domestic over-consumption of resources and the absence of incentives to achieve resources efficiency. This calls for a paradigm shift in policies and policy development.

Reforming pricing schemes would improve resources efficiency, enhance economic and climate resilience, lessen burdens on governments' budgets, and help achieve the newly adopted SDGs and mandates of the Paris 2015 Climate Summit. National and regional efforts to address climate change offer an unprecedented opportunity for a needed institutional reform in order to mainstream the nexus thinking in policy development and implementation. The newly established climate change agreement along with existing institutions and different forms of multi-stakeholder bodies already formulated in many Arab countries, could serve as a catalyst to mainstream the nexus approach at all levels of policy development.

Recommendations

To mainstream nexus thinking and approach in development strategies and plans, Arab countries need to:

- Improve resources efficiency towards the transition to sustainable economy through reforming economic policy and market incentives.
- Promote sustainable consumption and production patterns to achieve SDGs and mitigate and adapt to climate change mandate and targets as agreed upon in Paris climate summit in 2015.
- Harness existing multi-stakeholder platforms to improve policy coherence, institutional and social learning and leadership.
- Mainstream the nexus mental models, concepts, and tools in policy and development plans.

The WEF Nexus in the Arab Region Series is published by the League of Arab States (LAS), with technical and financial support from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Opinions expressed in the briefs do not necessarily reflect the views of either LAS or GIZ.

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Introduction

Water, energy and food are inextricably linked in the Arab region, perhaps more than any other region in the world. The interactions between the three sectors can be easily seen across the Arab region. Generally, the region is energy rich, water and land scarce, and food deficient. This necessitates the crucial needs to adopt the integrated nexus approach when addressing the management of those three vital resources. The basis of the "Water-Energy-Food Nexus" is an attempt to balance different uses of ecosystem resources (energy, water, land, and soil). There are clear interactions between water, food and energy

that may result in synergies or trade-offs between different sectors or different stakeholders.

The scarcity of natural resources is one of the major challenges for development in the Arab Region. Water scarcity and aridity, aggravated by the anticipated negative impacts of climate change, and dependency of the Arab region on fossil fuels to meet its energy needs constitute major challenges to a transition to a low carbon economy. The majority of the Arab countries are exposed to one or more resource scarcities in regard to water, energy or food resource within their

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territorial boundaries. In addition, Arab countries are adversely affected by volatility of the global food market as they rely on imported food products to cover between 50 and 100% of their food needs. Therefore, the WEF nexus approach is becoming an imperative to tackle the resource challenge in the Arab countries to help achieve the global mandate as defined by the SDGs and the Paris Climate agreement.

Resources Pricing Policies and Efficiency

Most of the Arab countries have had a long history of subsidizing energy, water, and food prices for different reasons. The long history of energy subsidy has been a major barrier to promoting energy efficiency and other sustainable energy options. Fuels and electricity are subsidized at rates averaging in excess of 50% of the cost of supply. Energy subsidies in some countries represent more than 9% of GDP. Subsidies for electricity and petroleum products are usually intended to allow citizens to share in their countries' natural-resource wealth or to make essential energy services available to the poor. However, subsidies tend to promote inappropriate consumer behavior, send wrong signals to consumers and suppliers, impair economic viability of sustainable energy options, aggravate environmental pollution and greenhouse gases (GHG) emissions, and pose a rapidly increasing burden on governments' finances. Moreover, the subsidy system implemented in most of the Arab countries is across-the-board subsidy system which works in favor of the rich rather than the poor.

Pricing water has been a contentious issue in most of the Arab countries due to perceived cultural and religious considerations. For example, the average price charged for water in the Arab region is about 35% of the cost of production, and in the case of desalinated water it is only 10%. The availability of inexpensive, heavily subsidized water has led to overuse and waste in the agricultural and municipal sectors, yet water remains a scarce resource in almost every Arab country.

Setting proper pricing policies can convey to consumers the real value of water driving them to increase its productivity and rationalize its use. While pricing is being looked at as the most effective method to ensure conservation, a major governance issue is how to provide the public with adequate and inexpensive water based on basic human needs perspective. An answer lies in imposing progressive tariffs for drinking water and rationing water in agriculture, while demanding water pricing at actual cost in commercial activities and industry. A progressive water tariff ensures that basic human needs for fresh water are met at a low, subsidized price, while excessive use is priced at a tariff that reflects cost. Such block-structure tariff enhances water use efficiency as well as social equity, and not only saves water but also the energy used to supply that water.

Arab governments maintain their obligations to the social contract by providing low-priced food and other goods and services to the population.

As a result, food subsidies are perceived to be important in promoting political stability. Balancing government and market-based policies is key for enhancing resource efficiency, sustainability and prosperity.

Arab Self-sufficiency Ratio of Major Food Commodities (2011)

Food items	Production	Consumption	Self-sufficiency ratio (%)
Cereals	54.5	119.6	45.6
Pulses	1.4	2.4	58.3
Vegetables	51.8	48.1	107.7
Fruits	33.2	31.9	104.1
Refined sugar	3.2	8.7	36.8
Fats and oils	2.2	4.0	55.0
Meat	8.4	11.0	76.4
Fish	3.9	4.0	97.5
Eggs	1.6	1.7	94.1
Milk and Dairy Products	27.8	37.5	74.1

Source: AMF Joint Arab Economic Report (2014)

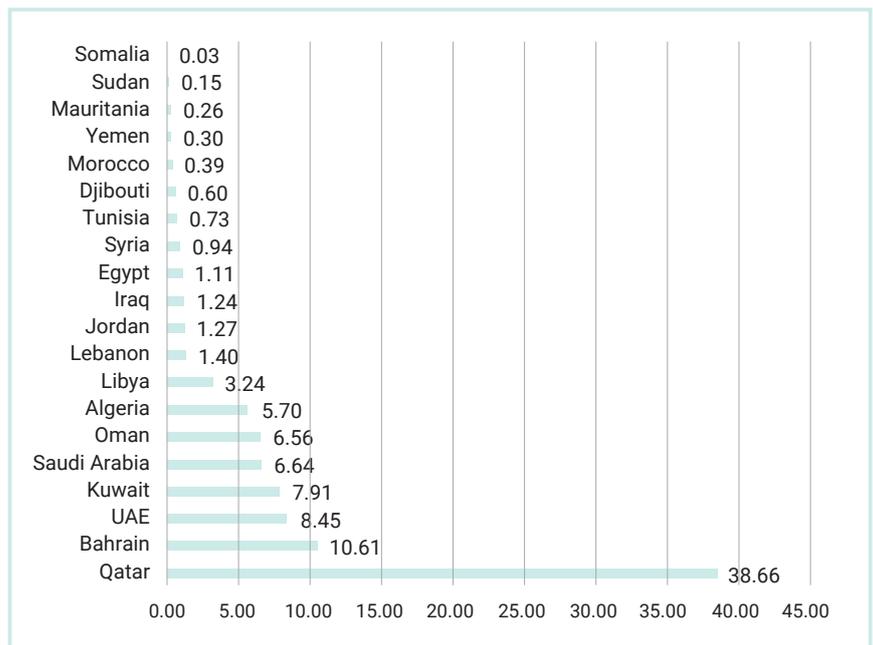
Consumption patterns in the Arab region depend on many factors including socio-economic conditions, demographic changes, urbanization rate, geographic factors, and subsidy policies. Disparities exist in level and patterns of water-energy-food consumption patterns amongst different Arab countries and between the rich and the poor in the same country. Generally, current consumption patterns are unsustainable in economic, social, and environmental terms.

IEA Estimates of Energy Subsidies In Selected Arab Countries in 2010

	Average Rate of Subsidization (%)	Subsidy (US\$ per person)	Total Subsidy (% of GDP)	Subsidy by Fuel (US\$ bn)			Total Subsidy (US\$ bn)
				Oil	Gas	Electricity	
Algeria	59.80	298.40	6.60	8.46	0.00	2.13	10.59
Libya	71.00	665.00	5.70	3.17	0.26	0.78	4.21
Egypt	55.60	250.10	9.30	14.07	2.40	3.81	20.28
Saudi Arabia	75.80	1,586.60	9.80	30.57	0.00	12.95	43.52
Iraq	56.70	357.30	13.80	8.87	0.28	2.16	11.31
Kuwait	85.50	2,798.60	5.80	2.81	0.90	3.91	7.62
Qatar	75.30	2,446.00	3.20	1.15	1.41	1.59	4.15
UAE	67.80	2,489.60	6.00	2.65	9.99	5.51	18.15

Source: UNDP, 2012

Disparity in Per capita energy consumption (TOE) in the Arab region



Source: World Bank, World Development Indicators, 2010

Municipal Water Tariff in Tunisia

One of the best examples for setting a water tariff that takes into account and balance the goals of social, financial, and economic aspects of water management in the Arab region is the Tunisian municipal water tariff. The tariff is set up as an increasing block tariff. The first blocks (set at 21-36% of average service cost) represent the social side which aims at enhancing access to water for low income citizens and to meet their basic needs, with low tariff both in urban and rural areas. This ensures the right of disadvantaged groups to adequately receive and access water as a human right obligation. The middle blocks (set at 45-82% of average service cost) represent the financial side which aims at maintaining the water utility with good financial health, thus enabling it to plan for and carry out capital investment projects that aim at ensuring sustainability of the sector and continuity of water supply. The last blocks (140-146% of average service cost) represent the economic side to achieve an optimal use of water resources and to control water demand, urging consumers to manage their consumption to help protect resources for future generations.

Source: ACWUA, 2014 (http://www.acwua.org/sites/default/files/management_of_water_utilities_-_case_studies_from_the_arab_region-email.pdf)

WEF Nexus and the SDGs

The resources scarcity challenges and other emerging development issues were recently well recognized in the Arab Strategic Framework for Sustainable Development (ASFSD) adopted by the league of Arab States in 2014. The ASFSD is promoting the nexus approach to water-energy-food sustainability in the Arab region, and encouraging the transition towards a low carbon economy to address the interdependencies between water, energy and food in order to make the nexus work for the poor. Besides, the nexus approach will enhance system thinking and integration of sectoral policies and this in turn will help the Arab region achieve the targets of the SDGs.

In the SDGs of the UN post 2015 global development agenda, the three components of the WEF security nexus are clearly laid out as:

- **Goal 2** calls for an end to hunger, achieving food security, improving nutrition, and promoting sustainable agriculture;
- **Goal 6** calls for ensuring availability and sustainable management of water and sanitation for all; and
- **Goal 7** calls for access to affordable, reliable, sustainable, and modern energy for all.

In addition, SDG13 addresses climate change.

In other words, access to water, energy and food are prioritized to achieve sustainable development. This highlights the necessity of the WEF nexus approach and the important role it can play in policy formulation for achieving both the SDGs and the Paris Climate Change targets. By acknowledging sustainable development inter-linkages among various environmental, social, and economic dimensions, the SDGs are better achieved through integrated management of resources. The WEF nexus approach, would offer the necessary foundation for informing decision makers of potential synergies and win-win situations for achieving sustainable development.

Are Current Policies Effective?

Though the Arab region was amongst the first regions to develop a regional strategy for Sustainable Consumption and Production (SCP), it is noticeable that implementation of such strategy at the national level is sub-optimal as the vast majority of SCP policies that exist in the Arab region are predominantly supply oriented. Examples of these are: improving efficiency of power generation and water networks, building of new desalination plants, and improving agriculture productivity. Demand-side

policies curbing and influencing consumer demand, for example by using economic instruments or rationalizing subsidies are rarely used. It is also remarkable that though the Arab SCP strategy identified energy, water, and food as regional priorities, yet the nexus concept was not matured enough at that time of its adoption in the year 2009. The strategy addresses the efficiency of those three resources independently. In most of the Arab countries, energy, water, and food policies are developed within each sector with little horizontal coordination. Additionally, climate change is still being addressed as an add-on policy issue rather than a core for development challenges in the region.

Paris Agreement and the NDCs

The Paris COP21 Agreement in 2015 marks the latest step in the evolution of the UN climate change regime, which originated in 1992 with the adoption of the UNFCCC. In the years since, the regime has evolved in different directions. The 1997 Kyoto Protocol took a more "top-down" but highly differentiated approach, establishing negotiated, binding emissions targets for developed countries, and no new commitments for developing countries. The protocol proved not to be effective as now it covers less than 15% of global emissions. The negotiations toward a Paris agreement were launched with the Durban Platform for Enhanced Action adopted at COP17 in 2011. The Durban Platform called for "a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties," to apply from 2020. COP 19 in Warsaw called on parties to submit "intended nationally determined contributions" (INDCs) well before the Paris conference, signaling an important bottom-up feature of the emerging agreement. Heading into Paris, more than 180 countries, including Arab countries, producing more than 90% of global emissions had submitted INDCs stating their GHGs mitigation commitment in support of the Agreement. All Parties adopted the Agreement in Paris, but it must still be signed and ratified by at least 55 countries accounting for at least 55% of global GHG emissions to enter into force. The long-term goal of the Paris Agreement is to strive to limit global warming to 1.5°C above the pre-industrial average and to achieve net zero GHG emissions by 2100. The agreement recognizes that all countries must contribute to the solution, while still accounting for the fact that countries are at different stages of development with different capacities to act and to provide climate finance. Once the Agreement goes into force, the switch from INDC to NDC would occur with the dropping of "intended", and switching from pledges to commitments. New guidance under the Agreement on NDC submissions will have to harmonize how Parties specify their NDCs (e.g., baselines and metrics). The new guidelines are expected during 2016. A major fact to recognize about the Agreement is that it calls for a huge amount of further negotiations and technical work to elaborate all its provisions, new processes, mechanisms, and bodies. All of this work needs to be completed well in advance of 2020, the first year of NDC implementation. Therefore, the next four years should be a period of intensive negotiating work on designing operational details.

Conventional policy- and decision-making in 'silos', therefore needs to give way to an approach that reduces trade-offs and builds synergies across sectors. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, and social systems. It offers real opportunities for synergies such as:

- Coordinated investments in infrastructure related to water, food and energy;

- Innovation to improve resource use efficiency and harness renewable energy to meet climate change obligations as per Paris Climate Change agreement in 2015;
- Use of economic instruments for stimulating investment including pricing of resources and ecosystem services;
- Maximizing the beneficial uses of water and energy amongst competing demand;
- Applied and adaptive research to enhance adaptation to climate change in the agricultural sector and to ensure production systems resilience;
- Capacity building and sharing of experiences at national and regional levels; and finally
- Bridging the present science-policy gap.

Policy Options

Clearly, there is a need for an institutional setup that enhances coordination, builds synergies, and reduces trade-offs across the three sectors. However, this does not mean creating new institutions, or new hard structures. The newly established climate change institutions and different forms of multi-stakeholder bodies such as national climate change committees, already formulated in many Arab countries, could serve as a catalyst to mainstream the nexus approach at all levels of policy development.

Arab Policymakers need to revisit their current and future development strategies and plans with a new nexus lens. Water, food and energy form a complex web of inter-linkages, and due to their strong interdependence, policies and subsidies in one sector strongly influence the other two sectors. For example, changes in energy policies and subsidies influence water use for food production. This has been evident in many Arab countries.

The subsidy system implemented in many Arab countries is across-the-board subsidy system, or universal, which in fact works in favor of the rich rather than the poor. Thus, the issue of pricing of water, energy and food has been always politically sensitive and thus requires careful consideration. Rethinking pricing schemes of the three resources needs to be undertaken in holistic approach taking into considerations the complexities of inter-linkages explained above. Furthermore, to achieve social justice, universal subsidies should give way to target subsidies for the needy segments of the Arab society to ensure equity and apply the policy “treat unequals unequally”. The most important policy reform to be considered is to revise the current pricing policies in these three sectors, and redesign them to reflect the real value of the resources and to contribute to their sustainability. These pricing policies should aim to ensure that basic human needs are met, incentivize conservation of resources, and recover the cost of their service provision without impacting the poor groups of the society.

Moreover, in order to achieve both the mandate and targets of the SDGs and the Paris 2015 Climate agreement, Arab policy makers need to mainstream the WEF nexus approach in their sustainable development strategies, plans, and programs. The League of Arab States needs to revise its current institutional framework of sustainable development to foster the WEF nexus approach, system thinking and institutional learning.

National and regional efforts to address the climate change challenge offer an unprecedented opportunity for a needed institutional reform in order to mainstream the nexus thinking in policy development and implementation. Several pioneering projects are offering opportune examples of the need to foster the nexus approach. The Saudi first solar desalination plant to produce 60,000 cubic meters per day of desalinated water will be the world’s largest utility scale solar desalination plant (**Policy Brief 6**). Another excellent example is the lake Manzala

engineered wet land in Egypt, which proved to provide an economically and environmentally sound alternative to traditional wastewater treatment facilities, while using the treated wastewater for agriculture and aquaculture. Both examples make a testing ground for the need to coordinate energy, water, and food policies, while reducing environmental footprint and improve resilience to climate change at the national level.

Lake MANZALA engineered wetland, Egypt

Lake Manzala is an internationally registered important Bird area by the Mediterranean Sea. Although Lake Manzala once supplied 30% of Egypt’s fish from a varied catch, including highly valued marine species such as mullet and sea bass, recently 90% of the fish catch has consisted of four small but hardy species of tilapia. Pollution of Lake Manzala has seriously threatened the health of local people and the viability of economic activities such as fisheries, raising livestock, and farming. Constructed wetlands provide an economically and environmentally sound alternative to traditional wastewater treatment facilities. Operation and maintenance costs are low and provide additional benefits such as the creation of wildlife habitats, and aquaculture. The success of a constructed wetland project in the Lake Manzala, which is funded by GEF, has created global interest in the potential of this technology as a low-cost and low-maintenance alternative for treating wastewater. At just one-quarter of the cost of conventional methods, the pilot wetland has removed 61% of the biological oxygen demand, 80% of suspended solids, 15% of total phosphorous, 51% total nitrogen, and 97% of total coliform bacteria. Following treatment, the majority of the water is used for irrigation and agriculture, while some is diverted into basins designed for fish farming. The engineered wetlands system also provides local livelihoods through support services and small-scale manufacturing ventures: plant harvesting and seedlings propagation for stocking the wetlands; production of fuel and animal feed pellets from harvested biomass; and harvesting of aquatic plants from the wetlands. The demonstration at Lake Manzala has created international visibility for constructed wetlands and it now provides Egypt with the opportunity to become a recognized leader in the development of this innovative technology.

Source: GEF: <https://www.thegef.org/gef/node/2191>

Conclusion

Integrated management of natural resources would enhance resource efficiency and ensure achieving SDGs at the national and regional levels. The ASFSD realized the WEF nexus as an effective tool to enhance resources efficiency and achieve sustainable development. Subsidies reform of energy, water, and food should be undertaken in holistic fashion to target the poor. Furthermore, the newly adopted Paris Climate agreement in 2015 along with the established climate change bodies at the national levels could serve as a catalyst to foster the WEF nexus approach.

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