

# Climate Change, Water and Energy in the MENA Region: Why a 'Nexus' Approach is Crucial for Mitigation and Adaptation

The Middle East and North Africa (MENA) have long lived with the challenges of an arid and extremely variable climate, but pressure on regional water systems is increasing rapidly, driven by population growth, socio-economic development, urbanization and environmental degradation. Existing supplies simply cannot meet the growing demand for irrigation and municipal water; as a result, the region must import most of its food.

Climate change is expected to bring even hotter, drier and more variable conditions; at the same time, the region's greenhouse gas emissions are rising rapidly, driven by the same socio-economic trends that are squeezing water supplies. It is clear that both adaptation and mitigation are urgently needed – and that to be effective, they cannot be undertaken in isolation, but rather must be mainstreamed into these countries' development strategies.

This discussion brief, based on new SEI research in the MENA region (with an initial focus on Jordan, Egypt and Lebanon), explains how a science-based “nexus” approach to adaptation and mitigation – specifically, to water and energy planning – could lead to smarter, more resilient development solutions.

## Vulnerability in the MENA region

All climate projections entail a degree of uncertainty, but climate models overwhelmingly agree on the trend in the Middle East and North Africa: Climate change will severely affect the region, bringing significant warming; longer, more intense and more frequent droughts and increasing uncertainty in rainfall and water availability. This makes the MENA region very vulnerable to all kinds of shocks, in addition to its reliance on volatile global food markets.

In most places, the water situation is already dire. The Nile, the Jordan and many other regional rivers are “closed basins”, with no unallocated water remaining, and many aquifers are severely over-exploited – far beyond natural replenishment rates. Yet climate change is typically seen as a distant threat, not an urgent priority, so it may not be taken into account in major long-term investments such as dams and new energy systems.

Responses to climate pressures are often limited to short-term, reactive emergency and coping measures. Climate information services and climate impact projection in the region are improving, but they are still not regionally coordinated. Socio-economic vulnerability is also significant. The rural poor, unskilled workers and internally displaced people – all large populations in the region – are particularly exposed and vulnerable.

These vulnerabilities are aggravated in most MENA countries by underinvestment in social safety nets and insufficient public services, such as water supply. Hence adaptation needs to be mainstreamed in conjunction with poverty alleviation, development and environmental planning. It is not an easy task, especially in countries dealing with political instability.



Power station of Aswan dam © TheEgyptian/Wikimedia Commons

However, the increased attention to climate change in the region creates an opportunity to implement more effective, integrated approaches to these challenges.

## The 'nexus' in the MENA context

In the MENA region, as in most of the world, water and energy have historically been managed separately, with little consideration of cross-sectoral interactions. In many cases, climate change has been assigned to yet another realm (in particular environment ministries). In the MENA context, adaptation is essentially about water (including water for food), while mitigation is about energy. To the extent that mitigation and adaptation have begun to be “mainstreamed” into national policies it has been within sectoral boundaries.

Yet in reality, water and energy are closely interconnected, and so are related adaptation and mitigation choices. Desalination technologies, for example, can be very energy-intensive and increase CO<sub>2</sub> emissions; some low-carbon energy solutions require large quantities of water. A robust scientific framework complemented by tools and consolidated databases can help decision-makers understand how man-made systems interact with one another and with nature, and how they can be co-managed.

By addressing water and energy together, planners can identify crucial interactions, conflicting demands and potential synergies. The resulting solutions may serve both adaptation and mitigation, such as combining wastewater treatment and reuse with energy production from sludge. Or they may simply avoid negative impacts, as with carbon-neutral solar desalination.

This is what we mean by a “nexus” approach: cutting across sectoral boundaries and looking at the “big picture” to ensure a more climate-resilient future.

## Seizing an opportunity

Awareness of climate change has risen significantly in the MENA region, driven both by water concerns, and by countries' growing involvement in the global climate policy dialogue; Qatar's role as host of this year's United Nations Conference on Climate Change, COP18, is a powerful catalyst.

### A closer look - Lebanon

Lebanon has more water than most of its MENA neighbours, much of it from snow that falls – and is then helpfully stored – on its mountains. Yet that snowfall could decline sharply: by 40% with 2°C of warming, and 70% with 4°C, according to the country's Second National Communication to the United Nations Framework Convention on Climate Change. Because Lebanon is narrow, water also quickly runs off from the mountains into the sea. And coastal aquifers are threatened by seawater intrusion from over-

pumping and sea level rise. New artificial water storage could help to buffer increasing variability.

On the energy side, Lebanon has extensive untapped renewable-energy potential (hydropower, wind and solar), but these are not currently managed in an integrated way; existing dam and hydropower plans have not been implemented. Institutionally, Lebanon has the potential to lead nexus implementation given its integrated Ministry for Water and Energy.

Lebanon can address water, energy and climate needs simultaneously through technologies such as solar desalination and water storage that co-produces hydropower and irrigation water. There are also ample opportunities for water demand management (serving both adaptation and mitigation) in agriculture and other sectors, and for better land-use planning. Treating and reusing wastewater and recovering energy from it would also yield significant benefits.

This is an opportunity to promote much-needed reforms and innovations. These measures are “win-wins” for the region even without considering climate change, as they will boost resilience to current climate variability, help address the impacts of socio-economic trends, and make government more effective.

#### Further reading:

Hoff, H. (2011) *Understanding the Nexus*. Background Paper for the Bonn2011 Conference: The Water, Energy and Food Security Nexus. Stockholm Environment Institute, Stockholm. <http://sei-international.org/publications?pid=1977>.

Hoff, H., Bonzi, C., Joyce, B. and Tielbörger, K. (2011) 'A Water Resources Planning Tool for the Jordan River Basin'. *Water*, 3(3). 718–36. doi:10.3390/w3030718.

Purkey, D. R., Heaps, C., Sieber, J. and Davis, M. (2012) *Integrating the WEAP and LEAP Systems to Support Planning and Analysis at the Water-energy Nexus*. SEI Factsheet. Stockholm Environment Institute, Somerville, MA, US. <http://sei-international.org/publications?pid=2145>.

This discussion brief was written by Magnus Benzie, Marion Davis and Holger Hoff. It is based on SEI research conducted as part of the GIZ (German Agency for International Cooperation) programme Adaptation to Climate Change in the Water sector in the MENA region (ACCWaM), which supports the League of Arab States and national water ministries in mainstreaming and climate-proofing.

#### Policy recommendations:

- Existing win-win opportunities for cross-sectoral (inter-ministerial) coordination must be seized. This includes the cooperation across government ministries and forthcoming national climate adaptation strategies or plans.
- MENA governments should take advantage of powerful new tools that facilitate integrated water and energy (and mitigation and adaptation) planning. This year, SEI linked its Water Evaluation And Planning (WEAP) system and the Long-range Energy Alternatives Planning (LEAP) system, used for mitigation and low-emissions development planning. Both tools are well known in the region; Lebanon, for example, has used WEAP to prepare its national water plan and it used LEAP for its Second National Communication. In Jordan, WEAP is an integral part of the national water master plan.
- Existing national adaptation plans should be periodically reviewed to incorporate new information (including new science) and to build more integrated, cross-sectoral solutions; existing strategies need to be implemented through corresponding action and investment plans.
- There is great potential for regional cooperation, in knowledge- and technology-sharing, joint resource management (as within the Nile basin), and joint initiatives to promote nexus-based solutions. A regional approach could also open up new finance options, such as enhanced access to global climate funds or the creation of a dedicated MENA climate fund, perhaps, through the OPEC (Organization of the Petroleum Exporting Countries) Fund for International Development.

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