

Middle East and North Africa Region



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Among the world's regions, the Middle East and North Africa (MENA) is especially vulnerable to climate change. It is one of the world's driest, most water-scarce regions, depends on climate-sensitive agriculture, and has a large share of its population and economic activity in flood-prone urban coastal zones. In addition, climate-induced resource scarcity could further tensions in the region's conflict-ridden areas, potentially escalating violence and political turmoil even beyond the region's boundaries.

On the other hand, societies of this region have had to deal with water scarcity and high temperatures for thousands of years, and have over time developed adaptive mechanisms to cope with these challenges, ranging from large-scale water management to drought-resistant crops selection. Furthermore, some areas of the world are expected to experience changes that will render their climate increasingly arid. Thus the MENA region, where adaptation to such conditions has already taken place and various strategies have been tried and tested, is a valuable repository of traditional and institu-

tional knowledge. This could prove an important contribution to the effort to address climate change globally.

Climate Change in MENA

High average temperatures and low precipitation levels are important physical constraints to the habitability of the Middle East and North Africa region, forcing those living there to find adaptive strategies to cope with the conditions. Climate change is putting additional stress on the region's marginal environment. For much of the region, the climate is predicted to become even hotter and drier, according to recent scientific assessments (IPCC 2007).

Higher temperatures and reduced precipitation will increase the occurrence of droughts, an effect that is already materializing in the Maghreb. Climate change will also require a more severe adjustment in the management of the region's water resources than any other region, since over three-quarters of MENA's water resources are already being exploited for human uses.

Global models predict sea levels rising from about 0.1 to 0.3 meters by 2050 and from about 0.1 to 0.9 meters by 2100 (Dasgupta and others 2007). For MENA, the social, economic, and ecological impacts are expected to be relatively higher compared to the rest of the world. Low-lying coastal areas in Tunisia, Qatar, Libya, UAE, Kuwait, and particularly Egypt are at special risk.

It is estimated that an additional 80–100 million people will be exposed by 2025 to water stress, putting further pressure on groundwater, which is currently being extracted in most areas beyond the aquifers' recharge potential. In addition, agricultural yields, especially in rainfed areas, are expected to fluctuate more widely, ultimately falling to a significantly lower long-term average. In urban areas in North Africa, a temperature increase of 1–3° C could expose 6–25 million people to coastal flooding. In addition, heat waves, an increased “heat island effect,” water scarcity, decreasing water quality, worsening air quality, and ground ozone formation are likely to lead to an overall worsening of public health and, more generally, to worsening living conditions.

Impacts of Climate Change on Regional Development

Notwithstanding its recent impressive economic performance, largely driven by the oil boom, the region faces a number of persistent challenges to its longer-term development prospects, including high unemployment, limited access to export markets, social exclusion, and weak public governance.

While several countries in the region have embarked on ambitious reform processes to tackle such challenges, much of the progress could be jeopardized by climate change. Income and employment could be lost to more frequent droughts in rural areas and to floods and sea surges in urban and coastal areas. Changes in temperature and precipita-

tion patterns could damage strategic sectors such as tourism or others with growth potential such as high value-added agriculture. The combination of such impacts could slow down the reform process in governance and public sector management, discourage trade and foreign investments, and ultimately offset the growth benefits generated by high oil prices.

Priorities for MENA in Climate Change Adaptation

In terms of adaptation, the main regional challenges are in water resource management, agriculture and rural development, urban development, and other cross-cutting issues. Climate change also could add a new challenge in the region's efforts to create new jobs and to address poverty, which currently affects about 20 percent of the total population, equal to 59 million people (using a poverty line of \$2 per capita per day for a largely middle-income region) (Iqbal 2006).

Agriculture. In the agricultural sector, climate change could accelerate desertification, reduce yields and increase their volatility (especially in cereals), threaten rural jobs, increase the fiscal burden of government intervention in support of the sector, and thwart efforts to improve access to foreign markets for high-value crops.

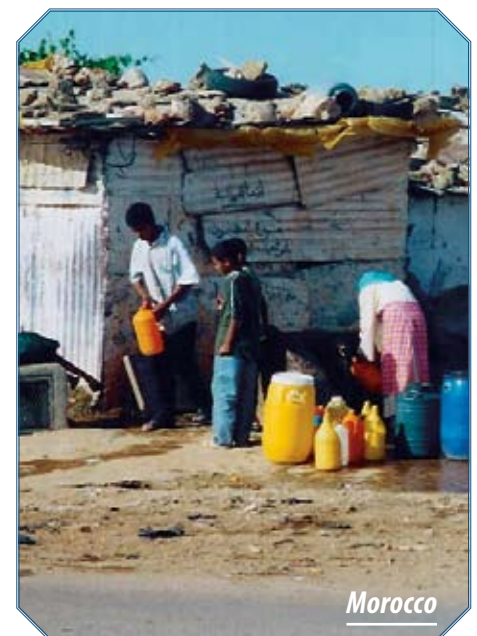
Urban areas. About 167 million people—56 percent of the region's total population of 298 million—live in cities, and 63 million in cities of 1 million and more. The cities of the region are the heart of all social, cultural, and political life and are the hub of all economic activities. Climate change poses many challenges to the region's cities. Rising sea level could affect 43 port cities—24 in the Middle East and 19 in North Africa. For example, sea level rise is expected to heavily impact Alexandria, Egypt. A 0.5-meter rise would leave more than 2 million people displaced, with \$35 billion in losses in land, property, and

infrastructure, as well as incalculable losses of historic and cultural assets. The region's urban areas also will be adversely affected by heat waves, water scarcity and decreasing water quality, and worsening air quality. In turn, these direct impacts could affect migration flows, in and out of urban areas.

How the Bank Can Help

The Bank has a key role to play in integrating adaptation into the region's regular development effort, strengthening the knowledge base, and promoting partnerships and regional cooperation. The Bank is currently strengthening existing initiatives that support adaptation to climate change and is in the process of developing plans for additional, innovative action, as well as plans to adopt suitable tools to ensure that all of its projects are “climate-proofed”—that is, they are not designed, sited, or implemented in ways that render them vulnerable to climate change impacts.

Partnerships. Successfully tackling climate change will depend significantly on the ability to promote consensus on the need to act and to support the growth in institutional



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and technical capacity. To achieve these objectives, the Bank will establish a region-wide program of cooperation and technical assistance on climate change adaptation and mitigation, building on the remarkable success of the Mediterranean Environmental Technical Assistance Program (METAP) in advancing the environmental agenda in the region.

The Bank has started piloting a comprehensive approach to support adaptation in the region through a combination of analytical and advisory (AAA) work and project-based investment. In Morocco, the impacts of climate change are being analyzed through three separate studies on agriculture, water resource management, and urban development. In addition, support to water management in irrigation is being promoted in the Oum Er Rbia basin as a strategy to cope with climate change (see *Box*, top right). Similarly, in Yemen, the Bank has started AAA work to analyze climate change impacts on water management. A project that will promote agrobiodiversity to enhance resilience to climate change on rainfed lands is in preparation (see *Box*, bottom right).

Issues and Risks

Ultimately, the success of climate change initiatives depends on client commitment to action. In some countries, particularly the region's International Development Association (IDA) countries and those affected by conflict, the prospects for action are constrained by short-term issues. The region's two IDA countries are particularly vulnerable to climate change impacts—Djibouti, which is threatened by floods and sea-level rise, and Yemen, where climate change could affect rainfed agriculture, fisheries, and groundwater resources.

In parts of the region affected by conflict (Iraq, West Bank and Gaza, Lebanon), climate change could appear as a longer-term concern when compared to the present need to tame internal violence or end hostilities

Water Management and Adaptation to Climate Change in Morocco

The Oum Er Rbia River basin contains half of Morocco's public irrigated agriculture and produces 60 percent of its sugar beets, 40 percent of its olives, and 40 percent of its milk. For the past decade, lower-than-predicted rainfall patterns have reduced available irrigation water to about half the designed volume. As a result, farmers are supplementing surface water by pumping groundwater, and aquifers are falling by up to 5 meters per year. Uncertainty about irrigation water supplies is a major factor deterring farmers from switching to higher-value crops, and tensions over access to water resources are rising.

The Moroccan government is working with the Bank to design ways to make irrigation in the basin more sustainable and more profitable. The authorities will commit to providing a fixed amount of water to the farmers on an on-demand basis, so they have confidence that water will be available at exactly the time they require it. The farmers will have to commit to not exceeding a fixed quantity of water consumption and will be sanctioned if they exceed this limit. The project will subsidize localized irrigation equipment (drip, micro-sprinklers, etc.), promote private investment in post-harvest infrastructure, and help farmers link to domestic and international markets.

with neighboring countries. In fact, climate change is already affecting livelihoods in many communities in these countries.

Climate change is also expected to add new challenges to the social and political agenda, spanning across class boundaries and administrative jurisdictions, and affecting rural and urban spaces alike. First, worsening of living conditions in rural areas could affect internal and international migratory flows. Second, the impoverishment of the natural resource

base (water, soil) might lead to renewed social tensions and conflict. Third, climate change could also impede efforts to advance prospects for women, thus delaying progress on gender issues of particular significance to the region. Finally, climate change could put additional stress on the region's already fragile political institutions and systems of governance.

The challenge for governments and development partners is to mobilize sufficient

Agriculture and Adaptation to a Changing Climate in Yemen

In Yemen, the poorest economy among the Arabian Peninsula countries, agriculture contributes more than 15 percent to GDP and employs more than 55 percent of the economically active population. Many of the poor derive their livelihoods and incomes exclusively from agriculture and agriculture-related activities. Climate change is a real concern for Yemen, particularly should the frequency of precipitation events diminish, putting rainfed agriculture in peril.

In the Yemen highlands, farmers have long traditions of agrobiodiversity farming practices and traditional knowledge. The Bank is currently working on coping strategies for adaptation to climate change for highland farmers who rely on rainfed agriculture. These strategies include the conservation and utilization of biodiversity important to agriculture (particularly the local landraces and their wild relatives) and associated local traditional knowledge. The project will emphasize the conservation of agrobiodiversity and developing a range of coping mechanisms using predictive climate modeling.



resources to act promptly, thereby reducing the cost of adaptation by minimizing climate change impacts, especially on the more vulnerable social groups.

Directions for the Future

An increasing level of awareness is building among all stakeholders in the region on the significance of climate change, reflecting both the global increase in sensitivity to and awareness of the climate change issue, as well as mounting concerns in the region about increasingly frequent droughts and looming water supply shortages. There is a general sense of the inevitability of assuming some kind of action, but questions remain on establishing priorities and developing an appropriate response.

There seem to be three broad areas of partnership where the World Bank and its MENA counterparts can make a dent in the adaptation agenda.

1. **Infrastructure investment.** The World Bank has an annual pipeline of some \$1.1 billion over the next three years. Projects will need to be sited, designed, and implemented in ways that will

minimize their vulnerability to climate change. In addition, enhancing climate resilience is likely to require scaling up planned infrastructure investment in key sectors such as water resources or urban development, which in turn will necessitate additional resource mobilization from governments, the private sector, and the donor community, including the World Bank.

2. **Knowledge strengthening.** Adequate design of adaptation interventions will require better knowledge on the timing, location, and magnitude of impacts, as well as identification of least-cost options to minimize such impacts. Building on the analytical work already under way in Morocco, Tunisia, Djibouti, and Yemen, and drawing on experience accumulated in the rest of the world, the Bank will expand its support to enhancing the knowledge required for MENA to adapt to climate change.
3. **Policy reform.** Significant progress in adaptation can be achieved by improving the policy and incentive framework. Fiscal reforms can encourage more efficient use of land, water, and energy resources, thereby promoting their allocation to more climate-resilient uses and freeing up valuable public funds, which could be used for protecting

the most vulnerable social groups. The World Bank will continue to work with its MENA clients to identify, analyze, and implement these reform options by mobilizing global knowledge and by providing targeted financial support.

References

Dasgupta, S, B. Laplante, C. Meisner, D. Wheeler, and J. Yan. 2007. "The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis." World Bank Policy Research Working Paper 4136. Washington, DC: World Bank.

IPCC (Intergovernmental Panel on Climate Change). 2007. "Climate Change 2007: Impacts, Adaptation, and Vulnerability." In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, eds., contribution of Working Group II to the *Fourth Assessment Report of the IPCC*. Cambridge, UK: Cambridge University Press.

Iqbal, F. 2006. *Sustaining Gains in Poverty Reduction and Human Development in the Middle East and North Africa*. Washington, DC: World Bank.

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