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# Reducing the impacts of drought in Lebanon

How the MENAdrought project is supporting Lebanon to enhance its water and food security



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## Lebanon: Key water facts

### Water audit

- Water storage infrastructure is limited; and 70% of the water in rivers flows into the Mediterranean Sea.
- Water shortages are common. During periods of scarcity, water delivery to homes is limited. Many people buy bottled water, or source it from private tankers.
- An influx of Syrian refugees has decreased per capita water availability.
- Agriculture consumes 64% of water from surface and below-ground sources.

### Vulnerabilities

- Water scarcity affects groundwater quantity and quality, with pollutants in groundwater and surface water threatening human health, irrigation, and municipal water supplies.
- Agricultural production depends on precipitation for rain-fed and irrigated cultivation; food produced at home covers half of people's needs.
- There have been four intense drought periods since 1991. In 2014, the country received only half the annual average rainfall of 812 mm, causing issues for farmers.
- There is no guiding national strategy for drought response and mitigation, and little coordinated drought management to support communities and businesses during prolonged dry periods.

## How water scarcity affects domestic users and agriculture in Lebanon

As climate change disrupts historical weather patterns, droughts are increasingly likely to have detrimental impacts on water and food security in the Middle East and North Africa (MENA) region. Lebanon is unique among the region's countries, due to its small landmass, more humid and diverse climate, and higher levels of urbanization. Despite its generally wetter conditions, the country's water security is challenged by various ongoing issues.

Water storage infrastructure is particularly low in Lebanon: the country has only two dams, and 70% of the water carried by its 16 rivers simply flows into the Mediterranean Sea. The water system networks across the country require increased investment to improve their condition. Water shortages are common, with water flowing from the tap for just one-to-three hours a day on average in some areas. Many Lebanese people buy large quantities of bottled water to meet their needs, or source water from expensive private tankers.

Illegal wells exploit Lebanon's eight main aquifers, pushing them far beyond their recharge capacity. Meanwhile, the quality of the subsurface water in coastal aquifers is increasingly affected by seawater intrusion. This ongoing water scarcity affects the

quality, as well as the quantity, of water available. Chemical and biological pollutants accumulate in groundwater and surface water, with consequences for human health, irrigation, and municipal water supplies.

The agriculture sector uses most of Lebanon's water supply, consuming some 64% of water diverted from surface water and groundwater sources. Agricultural production, which covers more than 230,000 hectares of land, is highly dependent on annual precipitation for both rain-fed and irrigated cultivation, with production being split almost equally between the two. And although agriculture has limited input to the country's economic base – contributing 3.53% to gross domestic product – food produced domestically covers around half of the population's needs. Remaining food needs are met by global imports.

The country has experienced four intense drought periods since 1991, characterized by a precipitation deficit of 40% or more. None of Lebanon's major agro-ecological zones were spared these droughts, with coastal plains, mountains, and inland areas all suffering crop and income losses. Exacerbated by a combination of rapid snowmelt, the drying up of springs and the late start of the autumn season, these dry years were challenging for the country's water budget.

The particularly severe drought of 2014 was a wake-up call for many water users of Lebanon's increasing vulnerability to drought. The country received only half the annual average rainfall of 812 mm, reducing the volume of water available in rivers and aquifers. Unable to tap into the traditional reserves of water from wells and rivers, farmers had to resort to pumping groundwater, often illegally, to avoid disastrous harvests over the summer months. A combination of changing climate conditions, stressed water resources, rapid population increase, and shifting social and economic conditions meant Lebanon could no longer rely on rainfall alone to serve its water needs.

## A need for better drought management

Presently, there is little coordinated drought management in place to support communities and businesses through these extreme events. There is no guiding national strategy for drought response and mitigation, and the distributed nature of political power, limited government resources, and fragmented water rights regimes makes integrated action difficult. Drought-management activities are primarily undertaken by individual institutions through their own frameworks, with interventions typically comprising resilience-building endeavors. These have increased notably in the last decade.

## How the MENAdrought project is supporting nations to manage drought

Led by the International Water Management Institute (IWMI), the MENAdrought project aims to empower Lebanon, Jordan, and Morocco with the tools to anticipate, prepare for and mitigate the worst impacts of drought. In Lebanon, in collaboration with officials from the government, IWMI and partners are developing technical monitoring and forecasting capabilities, as well as a drought framework encompassing institutional planning and the work of a task force on drought management. The task force will supervise and coordinate the development of drought policy. Work of the MENAdrought project will be focused at the national level, as well as supporting the important Orontes River Basin.

## Promoting effective drought management within Lebanon

The project focus is on strengthening in-country capacity and locally led developments to create an environment where improved drought management can flourish. The aim is to enhance the self-reliance capacities of the nation – so it can effectively manage drought and reduce its impacts – and to support ownership of drought-management responses with the help of open-source data and software. The project aims to catalyze sustainable, enterprise-driven resilience building by focusing on the three pillars of integrated drought risk management.

## Three pillars of action for change

### Pillar 1: Monitoring and early warning systems

IWMI has developed a map-based monitoring system using an enhanced Composite Drought Index (eCDI) to detect drought impacts on both irrigated and rain-fed water systems. In Lebanon, during the coming months, the project will establish an early warning rainfall forecasting system to predict the likely onset of drought. This will enhance farmers', water and agriculture managers', and policy makers' preparedness and resilience by facilitating forward planning. The mapping and monitoring tools will be put into operation within relevant ministries to create long-term sustainability beyond the project life cycle. They are an important component for developing official drought definitions and determining triggers for the actions of Pillar 3.

### Pillar 2: Assessments of vulnerability to drought

If policy and planning actions are to be targeted and effective, it is crucial to know which communities, economic sectors and environments are most affected by droughts, and why they are particularly vulnerable. Insights gained from examining the economic and social costs of past droughts in each of the project countries will help to inform and orient investments in the infrastructure, institutions and information systems needed to enhance drought management.



To add important detail to this assessment within Lebanon, IWMI is conducting case study analyses in the important Orontes Basin. This is a transboundary river basin covering 24,660 km<sup>2</sup>, of which 8% is in Lebanon. The river flows downstream from its mountain source in Lebanon for about 40 km and then continues onwards into Syria and Turkey. The Orontes Basin is particularly significant for exploring how drought affects the national economy, and as a source of case studies exemplifying the complexities of drought impacts.

### Pillar 3: Mitigation, preparedness and response

Pillar 3 focuses on mitigation, preparedness and response. The findings of Pillars 1 and 2 are the starting points for co-designing policy and planning interventions. The monitoring technology of Pillar 1 provides critical evidence used for triggering actions. And Pillar 2 assessments capture the drivers, vulnerabilities and systemic interlinkages of drought impacts within a country – from which targeted, cost-effective and sustainable mitigation policies and responses can be developed. For mitigation, the focus is on developing water and agricultural technology packages that can help build resilience to drought in the specific context of Lebanon and the Orontes River Basin. To enhance preparedness, IWMI is working closely with multi-ministerial, interdisciplinary teams from across the Government of Lebanon and at various levels – from technical drought monitoring to policy and management planning. This involves working sessions and ‘write shops’ that bring together ideas, experiences and insights from many stakeholders. The insights gained will be used to define the Lebanon Drought Action Plan, outlining the actions, roles, and responsibilities needed for effective drought response.

Project	MENAdrought
Participating countries	Lebanon, Jordan, and Morocco
Timeframe	August 2018 – September 2022
Donor	United States Agency for International Development (USAID)
Partners	<p>International Water Management Institute (IWMI); National Drought Mitigation Center, University of Nebraska-Lincoln; Daugherty Water for Food Global Institute, University of Nebraska; Goddard Space Flight Center, National Aeronautics and Space Administration (NASA); and Johns Hopkins University.</p> <p><b>National leader:</b> Ministry of Energy and Water.</p> <p><b>National partners:</b> Ministry of Environment; Ministry of Agriculture; Lebanese Agricultural Research Institute (LARI); Lebanese Meteorological Department, Directorate General of Civil Aviation; Litani River Authority; American University of Beirut; South Lebanon Water Establishment; Litani Mount Lebanon Establishment.</p> <p><b>Non-governmental organizations:</b> ACTED and STAMMOSE.</p>
For more information	<p>Project website: <a href="https://menadrought.iwmi.org/">https://menadrought.iwmi.org/</a></p> <p><b>Contact:</b> Rachael McDonnell, Deputy Director General - Research for Development, IWMI (R.Mcdonnell@cgiar.org)</p>

