Local Water Security Assessment

for Improved Water Management in Selected Countries of the Middle East and North Africa (MENA) Region

Professor Dr. Slobodan Milutinović

REC Paper • May 2016

Sustainable Use of Transboundary Water Resources and Water Security Management (Water SUM) Project, Component 2: Water and Security (WaSe)
This technical report was produced in the framework of the project “Sustainable Use of Transboundary Water Resources and Water Security Management in the MENA region (WaterSUM)”, Component 2: Water and Security. The report assesses local water security for improved water management in selected countries in the Middle East and North Africa region. The countries included in the assessment are Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.
Local Water Security Assessment

for Improved Water Management in Selected Countries of the Middle East and North Africa (MENA) Region

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Abbreviations

ABAU  Al-Balqa' Applied University
ABH  River basin agency (Agence de Bassins Hidrographiques)
ACC  Agricultural Credit Corporation of Jordan
ACWUA  Arab Countries Water Utilities Association
ADB  African Development Bank
ADE  Algerian National Water Company (L'Algérienne Des Eaux)
AFD  French Agency for Development (Agence Française de Développement)
AG  Arabia Group
AIC  Public interest associations in Tunisia (Associations d'intérêt collectif)
ANBT  National Dam and Inter-basin Transfer Agency of Algeria (Agence Nationale des Barrages et des Transferts)
ANPE  National Environment Protection Agency of Tunisia (Agence Nationale de Protection de l'Environnement)
ANRH  National Agency for Water Resources of Algeria (Agence Nationale des Ressources Hydrauliques)
AssIG  Imprint Goodness Association
AUEA  Agricultural Water Users' Associations in Morocco (Association d'Usagers de l'Eau Agricole)
AWARENET  Arab Integrated Water Resources Management Network
BIRH  The Hydraulic Inventory and Research Bureau of Tunisia (Bureau de l'Inventaire et des Recherches Hydrauliques)
BPEH  Bureau of Water Planning and Hydraulic Equilibrium of Tunisia (Bureau de la Planification et des Equilibres Hydrauliques)
BWRO  Brackish water reverse osmosis
CBD  Convention on Biological Diversity
CBO  Community-based organisation
CBWRM  Community-based water resources management
CDR  Council of Reconstruction and Development in Lebanon
CDUPE  Centre for Urban Development and Protection of the Environment in Essaouira, Morocco
CITET  International Centre of Environment Technologies of Tunisia (Centre International des Technologies de l'Environnement)
CLEQM  Central Laboratory for Environment Quality Monitoring of the National Water Research Centre of Egypt
CNE  National Water Committee of Tunisia (Comité National de l'Eau)
CRDA  Regional Office of Agricultural Development of Tunisia (Commissariats Régionaux au Développement Agricole)
CSEC  High Council of Water and the Climate of Morocco
CWSI  Canadian Water Sustainability Index
DG BGTH  Directorate General of Dams and Great Hydraulic Works of the Ministry of Agriculture and Hydraulic Resources of Tunisia (Direction Générale des Barrages et Grands Travaux Hydrauliques)
DG GREE  Directorate General of Rural Engineering and Water Exploitation of the Ministry of Agriculture and Hydraulic Resources of Tunisia (Direction Générale du Génie Rural et de l'Exploitation des Eaux)
DG RE  Directorate General of Water Resources of the Ministry of Agriculture and Hydraulic Resources of Tunisia (Direction des Ressources en Eau)
DGH  Directorate General of Hydrology of Morocco
DGHER  Directorate General of Hydraulic and Electric Resources of Lebanon
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<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>DGO</td>
<td>Directorate General for Operations of Lebanon</td>
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<tr>
<td>DHW</td>
<td>Provincial (wilaya) Water Department in Algeria</td>
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<tr>
<td>EA</td>
<td>Ecosystem approach</td>
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<td>EIB</td>
<td>European Investment Bank</td>
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<td>EMPOWERS</td>
<td>Euro-Mediterranean Regional Program for Local Water Management</td>
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<td>ENCID</td>
<td>Egyptian National Committee on Irrigation and Drainage</td>
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<td>EPADP</td>
<td>Egyptian Public Authority for Drainage Projects</td>
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<td>ESCWA</td>
<td>United Nations Economic and Social Commission for West Africa</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>EUWI-MED</td>
<td>EU Water Initiative, regional component responsible for water supply and sanitation and IWRM in Mediterranean countries</td>
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<tr>
<td>EWRA</td>
<td>Egyptian Water Regulatory Agency</td>
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<tr>
<td>FAO</td>
<td>United Nations Food and Agriculture Organization</td>
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<tr>
<td>FPEC</td>
<td>Future Pioneers for Empowering Communities</td>
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<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
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<tr>
<td>GCWR</td>
<td>General Commission for Water Resources of the Ministry of Irrigation of Syria</td>
</tr>
<tr>
<td>GCWW</td>
<td>National Company for Water and Wastewater of Libya</td>
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<tr>
<td>GDA</td>
<td>Farmers' Development Groups in Tunisia (Groupement de Développement Agricole)</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gases</td>
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<td>GIC</td>
<td>Farmers' Associations in Tunisia (Groupements d'Intérêts Collectifs)</td>
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<td>GIH</td>
<td>Hydraulic interest group in Tunisia (Groupement d'Intérêt Hydraulique)</td>
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<td>GIZ</td>
<td>German Agency for International Cooperation</td>
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<td>GMRA</td>
<td>Great Manmade River Authority of Libya</td>
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<td>GrTech</td>
<td>Green Tech Sustainable Environment</td>
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<td>GWA</td>
<td>General Water Authority of Libya</td>
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<td>GWP</td>
<td>Global Water Partnership</td>
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<tr>
<td>HCWW</td>
<td>Holding Company for Potable Water and Sanitary Drainage of Egypt</td>
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<tr>
<td>IAS</td>
<td>Irrigation Advisory Service within the Ministry of Public Works and Irrigation of Egypt</td>
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<td>ICARDA</td>
<td>International Center for Agricultural Research in Dry Areas</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>INDH</td>
<td>National Human Development Initiative in Morocco (Projet Initiative Nationale de Developpement Humain)</td>
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<tr>
<td>INRGREF</td>
<td>National Institute of Research on Rural Engineering, Water and Forests of Tunisia (Institut National de Reseurches en Genie Rural, Eaux et Forets)</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>IWRM</td>
<td>Integrated water resources management</td>
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<td>JICA</td>
<td>Japan International Cooperation Agency</td>
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<tr>
<td>JISM</td>
<td>Jordan Institute for Standards and Metrology</td>
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<tr>
<td>JOCCEPS</td>
<td>Jordanian Climate Change and Environment Protection Society</td>
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<tr>
<td>JUoST</td>
<td>Jordan University of Science and Technology</td>
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<tr>
<td>JVA</td>
<td>Jordan Valley Authority</td>
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<td>JVP</td>
<td>Jordan Valley Permaculture project</td>
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<tr>
<td>KFW</td>
<td>German government-owned development bank</td>
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<td>LA21</td>
<td>Local Agenda 21</td>
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<td>LCC</td>
<td>Local coordinating committee</td>
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<td>LDP</td>
<td>Local development plan</td>
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<td>LG</td>
<td>Local governments</td>
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<td>LHAP</td>
<td>Land and Human to Advocate Progress</td>
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<td>LRA</td>
<td>Litani River Authority in Lebanon</td>
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<td>LWSAP</td>
<td>Local water security action plan</td>
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<td>MALR</td>
<td>Ministry of Agriculture and Land Reclamation of Egypt</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>MAPM</td>
<td>Ministry of Agriculture and Fisheries of Morocco</td>
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<td>MARH</td>
<td>Ministry of Agriculture and Hydraulic Resources of Tunisia (Ministère de l'Agriculture de l'Environnement et des Ressources Hydrauliques)</td>
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<td>MEDD</td>
<td>Ministry of Environment and Sustainable Development of Morocco</td>
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<td>MEIH</td>
<td>Majlis El Hassan Organisation</td>
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<td>MEMEE</td>
<td>Ministry of Energy, Mining, Water and the Environment of Morocco</td>
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<tr>
<td>MENA</td>
<td>Middle East and North Africa</td>
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<td>MHUDD</td>
<td>Ministry of Housing, Utilities and Urban Development of Egypt</td>
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<td>MoA</td>
<td>Ministry of Agriculture of Jordan</td>
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<td>MoAAR</td>
<td>Ministry of Agriculture and Agrarian Reform of Syria</td>
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<td>Ministry of Environment of Jordan</td>
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<td>MoELA</td>
<td>Ministry of Environment and Local Administration of Syria</td>
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<td>MOEW</td>
<td>Ministry of Energy and Water of Lebanon</td>
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<td>MoH</td>
<td>Ministry of Health of Jordan / Environmental Health Directorate</td>
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<td>MoHHC</td>
<td>Ministry of Health, Housing and Construction of Syria</td>
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<td>MoHP</td>
<td>Ministry of Health and Population of Egypt</td>
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<td>MoI</td>
<td>Ministry of Irrigation of Syria</td>
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<td>MoLD</td>
<td>Ministry of Local Development of Egypt</td>
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<td>MoMA</td>
<td>Ministry of Municipal Affairs of Jordan</td>
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<td>MRE</td>
<td>Ministry of Energy, Mining, Water and the Environment of Morocco</td>
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<td>MU</td>
<td>Mutah University</td>
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<td>MWI</td>
<td>Ministry of Water and Irrigation of Jordan</td>
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<td>MWRI</td>
<td>Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI DA</td>
<td>Drainage Authority of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI GWS</td>
<td>Water Sector of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI ID</td>
<td>Irrigation Department of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI MED</td>
<td>Mechanical and Electrical Department of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI NRS</td>
<td>Nile River Sector of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI PS</td>
<td>Planning Sector of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI SA</td>
<td>Survey Authority of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>MWRI SPA</td>
<td>Shore Protection Authority of the Ministry of Water Resources and Irrigation of Egypt</td>
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<td>NES</td>
<td>National environmental strategy</td>
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<td>NGO</td>
<td>Non-governmental organisation</td>
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<td>NICE</td>
<td>National Implementation Committee for Effective Decentralised Wastewater Management in Jordan</td>
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<td>NOPWASD</td>
<td>Executive Organisation for Potable Water and Sanitary Drainage Projects of Egypt</td>
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<td>NWRC</td>
<td>National Water Research Centre of Egypt</td>
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<td>ODA</td>
<td>Official development assistance</td>
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<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>ONA</td>
<td>Algerian National Sanitation Office (Office National d'Assainissement)</td>
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<td>ONA(M)</td>
<td>National Office for Electricity of Morocco (Office National de l'Électricité)</td>
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<td>National Sanitation Office of Tunisia (Office National de l'Assainissement)</td>
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<td>ONEE</td>
<td>National Agency for Energy and Water of Morocco (Office National de l'Electricité et de l'Eau Potable)</td>
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<td>National Office for Drinking Water Supply of Morocco (Office National d'eau Potable)</td>
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<td>National Agency for Sanitary Safety of Food Products of Morocco</td>
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<td>ORMVA</td>
<td>Regional Agricultural Development Authority of Morocco (Offices Régionaux)</td>
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to Mise en Valeur Agricole)

PAGER National Programme for Rural Water Supply and Sanitation in Morocco (Programme d'action national pour l'environnement)

PANE National Environmental Action Plan of Morocco (Plan Communal de Développement)

PCD Municipal Development Plan of Morocco (Plan de Développement Municipal)

PCDES Local (Municipal) Economic and Social Development Plan in Morocco

PDIAIRE Master Plan for Integrated Water Resources Management of Morocco

PIC Problem-driven iterative adaptation

PIM Municipal Investment Plan in Tunisia

PMedE Pan Med Energy

PNR Development National Plan for Renewable Energy Development in Tunisia (Programme national de développement des énergies renouvelables)

PNDES National Economic and Social Development Plan in Morocco

PNEDM National Household Waste Plan of Morocco

PNPD National Water Plan of Morocco

PNR National Plan for Combating Global Warming in Morocco

PPP Purchase power parity

PRDES Regional Economic and Social Development Plan in Morocco

PSD Public Security Directorate/environmental rangers of Jordan

RADEEO Municipal Autonomous Agency for the Distribution of Water and Electricity in Oujda, Morocco

RAED Arab Network for Environment and Development

RSCN Royal Society for the Conservation of Nature of Jordan

RSS Royal Scientific Society of Jordan

RWE Regional water establishments in Lebanon

SDAU City Master Plan (Schemas Directeurs d’Aménagement Urbain)

SEA Strategic environmental assessment

SEACO SEACO Constantine Company

SEATA Annaba and El Tarf (Algeria) Water Authority (Société de l’Eau et de l’Assainissement d’El Tarf et d’Annaba)

SECADENORD Company for the exploitation of conveyance networks of the North in Tunisia (La Société d’Exploitation du Canal et Adductions des Eaux du Nord)

SEE State Secretariat in Charge of Water and the Environment of Morocco (Secrétariat d’État chargé de l’Eau et de l’Environnement)

SEEAL Algiers Water and Sanitation Utility Company

SEOR La Société de l’Eau et de l’Assainissement d’Oran (water and sanitation company)

SNAT National Spatial Development Scheme (Schéma national d’aménagement du territoire)

SNE-DD National Strategy of Environment and Sustainable Development of Algeria (Stratégie Nationale de l’Environnement et Développement Durable)

SNIMA Department of Industrial Standardisation of Morocco

SNPEDD National Strategy for the Protection of the Environment and Sustainable Development of Morocco (Stratégie Nationale pour la Protection de l’Environnement et le Développement Durable)

SONEDE National Company for Water Exploitation and Distribution of Tunisia (Société Nationale d’Exploitation et de Distribution des Eaux)

SRAT Regional Spatial Development Scheme (Schéma Regional d’Aménagement du Territoire)

SRU Strategic Research Unit of the National Water Research Centre of Egypt

SWIM-SM EU-funded Sustainable Water Integrated Management Programme

SWRO Seawater reverse osmosis

TAG Talal Abu Ghazaleh Organisation

UCLG United Cities and Local Governments

UNDP United Nations Development Programme

UNEP United Nations Environment Programme
<table>
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<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>UoJ</td>
<td>University of Jordan</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>USDWE</td>
<td>United Society for Developing Water Resources and Environment</td>
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<tr>
<td>VAT</td>
<td>Value added tax</td>
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<td>WAJ</td>
<td>Water Authority of Jordan</td>
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<td>WATSAN</td>
<td>Water and sanitation committee</td>
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<td>WEF</td>
<td>World Economic Forum</td>
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<td>WSSI</td>
<td>Water Security Status Indicators</td>
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<td>WTP</td>
<td>Wastewater treatment plant</td>
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<td>WUA</td>
<td>Water users’ association</td>
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<td>WWC</td>
<td>World Water Council</td>
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<td>WWF2</td>
<td>Second World Water Forum</td>
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Executive summary

Water security, at any level from the household to the global, means that every person has access to enough safe water at an affordable price to lead a clean, healthy and productive life, while ensuring that the natural environment is protected and enhanced (GWP 2000).

This report assesses local water security for improved water management in selected countries in the MENA region. The countries relevant for this assessment are Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.

Assessment results

Currently, MENA countries face major development challenges, including challenges from environmental stresses. Given the political and economic context, all the analysed countries can be classified according to three categories of suitability for WATER SUM Component 2 interventions:

- countries in which it is not possible to implement project activities due to war operations and serious security threats (Syria and Libya);
- countries with a fragile economic and, more importantly, political situation (Algeria, Egypt and Lebanon); and
- countries in which the implementation of project activities should not encounter major problems due to political and economic constraints (Morocco, Tunisia and Jordan).

Even though in a number of countries—especially in North Africa—reforms have been initiated in order to decentralise their systems, a high level of centralisation still characterises the MENA region. Local governments manage and implement central government programmes rather than their own, and are subject to the control of central government. Municipal, provincial or regional-level institutions in the majority of MENA countries are, at the same time, decentralised local authorities and de-concentrated administrative units. However, there is widespread recognition throughout the region that local governments need to become more transparent and accountable to local citizens, and some of the analysed countries have accelerated decentralisation processes (notably Tunisia and Jordan). In some other countries reforms have been counterbalanced by measures that in fact increase the power of supervision by centrally appointed government representatives (notably Morocco and Algeria).

Local authorities lack resources and financial power. They are frequently overstaffed but lack technical expertise and transparency. The quality of municipal planning remains a key challenge for municipalities throughout MENA. There is a lack of consideration of stakeholder involvement, as there have been limited mechanisms for including stakeholders in the preparation or implementation of plans. As a result, the majority of responsibilities assigned to municipalities have remained fairly ineffective, and their services are not sufficient.

Water resources are overexploited and the situation will probably worsen in the future. Currently, total water demand exceeds naturally available water supplies by almost 20 percent. Unmet demand (currently 6.6 billion m³) will increase more than
tenfold, to 65.5 billion m$^3$, endangering Egypt, Morocco and Syria the most. Among the analysed countries, Jordan, Morocco and Syria depend more heavily on groundwater. Today's unmet demand is met primarily through the unsustainable mining of fossil groundwater reserves, and partially by increasing water supplies through desalination. As a result, the water table has become much lower in recent years, with the salinisation of some (mainly coastal) groundwater, particularly in North African countries.

Among the main weaknesses of the water systems in the analysed countries are the fact that:

- the network of water pipes is generally outdated, too small, and in serious need of rehabilitation, reinforcement, repair and maintenance, and an enormous amount of water produced is non-revenue water;
- the wastewater infrastructure is outdated and in chronic need of maintenance;
- water use per sector is inefficient, with high water allocation to agriculture;
- water pricing is not efficient;
- water conservation programmes and government subsidies to encourage water conservation are limited or lacking;
- the product structure in the agricultural sector is inappropriate, including the cultivation of water-intensive crops; and
- political instability in the region has exacerbated water scarcity issues.

Sixty percent of surface water in the MENA region is transboundary. Another important issue is the deterioration in water quality, which is closely linked to water scarcity.

Recognition of the political importance of water seems to be improving in the region, and water is increasingly seen as a priority area by governments. Although there has been notable progress at the level of institutions and governance approaches, the institutional set-up in the water sector in the analysed countries is largely centralised and mostly managed at the national level, with little local stakeholder or civil society participation, resulting in ineffective, fragmented structures with the ministry in charge on the top of the decision-making pyramid and a clear hierarchy. This is clearly the situation in Algeria, Morocco, Jordan and Tunisia, and, to a lesser extent, in Egypt, where some governors have large powers. However, the process of decentralisation seems to be progressing (and in this respect Egypt, Jordan, Lebanon and Morocco are apparently more advanced). Coordination between different water-related institutions is a major water governance issue. The implementation of water policies shows modest levels of cross-sectoral coordination, with ineffective permanent structures or institutions. The enforcement of laws, the implementation of water pricing reforms and water governance–related issues remain challenging. Most efforts have failed due to inadequate compliance or poor enforcement.

Overall, both Jordan and Morocco have a high level of capacity for organisation in the water sector, demonstrated through both policy and legal improvements, as well as by the inclusion of all relevant government organisations, encompassing not only those in the water sector, but also those in the closely related sectors of agriculture and the environment. A high level of capacity is also evident in terms of infrastructure development, operation and maintenance in both countries.
The financing gap in the water sector represents one of the main shortcomings in terms of implementing water plans/strategies. A significant proportion of the financial support given by donors through loans and grants still covers the majority of infrastructure investments. Cost recovery is generally low, which has an impact on the financial sustainability of water services.

Population growth will exacerbate the existing water crisis. The expected increase in water stress related to population growth will affect most countries in the MENA region, although groundwater-based countries (Algeria, Tunisia, Libya and Jordan), which already suffer from water stress, will be most severely affected.

Climate change impacts may worsen this situation to the point where social conflicts arise as water resources become scarcer and access to water more difficult. More or less all the analysed countries are exposed to similar weaknesses that can increase their vulnerability to climate change. They are over-dependent on water-sensitive economic sectors such as agriculture, grazing, eco-tourism and aquaculture. The ecological base has already be damaged, in particular by water pollution, land degradation, desertification and the loss of biodiversity. Technological skills and financial and human resources for improving the water sector’s resilience to climate change impacts are relatively limited. Recognising these future challenges, most MENA countries have identified a number of actions that could potentially be taken to reduce their vulnerability, particularly with respect to their water and agricultural resources. However, when it comes to progress made on the water-related adaptation policy framework, various assessments show that progress has tended to be limited or moderate.

Stakeholder participation is modest in terms of water planning, and inadequate with respect to plan implementation. Although the participatory approach is relatively well recognised through the implementation of WUAs, effective public participation in water management and decision making remains weak and in some countries lacks supporting legislation.

Given the above, the MENA countries covered by this analysis (excluding Libya and Syria) were evaluated with respect to their performance in relation to water security. The analysis indicates that, out of the six analysed countries, Jordan is the most suitable for WATER SUM Component 2 interventions in relation to local water security. Tunisia is ranked second and Morocco third, both being particularly exposed to overall physical, social and environmental water scarcity.

As indicated by the preliminary stakeholder analysis, the “key players”, and in particular line ministries in charge of water, must be involved in the process from the very beginning. However, in order to ensure a successful participatory approach it is necessary to include less powerful stakeholders, who can nevertheless express a significant interest. Academics can play a better intermediary role as knowledge brokers between all groups of stakeholders. Non-governmental organisations that represent the public interest with regard to environmental concerns have a good knowledge of water management issues and have access to all crucial information from the main governmental stakeholders.

**Methodology for local water security action planning**

Local water security action planning (LWSAP) usually comprises two interrelated steps: an assessment of the current status of water security; and the development of a management or action plan. It is recommended to apply elements from two
assessment methodologies: Water Security Status Indicators (WSSI); and the Canadian Water Sustainability Index (CWSI). Based on the scale at which we are working (municipal), and given the fact that existing water management projects have been previously initiated with varying success in the region, we recommend the use of a methodology that builds on existing water security management activities and local knowledge rather than proposing a wholesale set of new solutions. For this reason, we recommend the use of the problem-driven iterative adaptation (PDIA) approach, which fosters step-by-step activities with rapid, results-oriented learning; engages a broad set of stakeholders from the very beginning; and focuses on reforming and building upon past activity rather than reflexively proposing new solutions.

Recommendations

- WATER SUM component 2 should affirm the approach to water security defined in the Global Water Partnership (GWP) declaration. Local water security issues should be addressed using a so-called developmental approach, which is based on developmental planning in the form of goals and targets, through a combination of policies, reforms and investment projects.

- It is highly advisable to make an adjustment to the original territorial scope of WATER SUM Component 2, and to plan project implementation in countries where project activities will not encounter major political and security obstacles, while project results will bring more efficient, accountable and sustainable effects with fewer efforts on the part of stakeholders. To that end, and given the overall ranking in indicator-based benchmarking, Jordan, Tunisia and Morocco (respectively) should be considered as the most appropriate countries from among the eight analysed; Algeria, Egypt and Lebanon (respectively) should be considered as countries appropriate for project interventions, but with a certain risk of political, institutional and other obstacles that may occur during project implementation; and Syria and Libya should be considered as countries not appropriate for project implementation.

- WATER SUM Component 2 should contribute to the development of water security–related policies at the local level in selected MENA countries, including the improvement of the institutional set-up at the local level, if and when needed. This should include (but should not be limited to) the development of local competencies in (1) setting local water management policy, including objectives and targets; and (2) the development, implementation and updating of local water security action plans (LWSAPs).

- Given the fact that the government systems in most MENA countries are strongly hierarchical in terms of power sharing, with limited decentralisation, every project activity should be carefully planned and coordinated with central government. Also, additional efforts should be made in order to best position project activities within the current framework of ongoing central government activities and strategic intentions (particularly the framework within the European Neighbourhood instrument; projects supported by the World Bank and the African Development Bank; regionalisation, decentralisation and public administration reforms; etc.).

- It is of crucial importance to establish clear links with higher tiers of water-related government bodies from the beginning of project implementation, through the establishment of a project steering committee, comprising high-
level representatives of responsible ministries from each country, and the establishment of Local Water Security Advisory Committees in each selected local unit, comprising (i) representatives of regional government (governorates in Jordan and Tunisia, governorates and regions in Egypt, and provinces in Morocco); (ii) representatives of territorial water management institutions (the Jordan Valley Authority [JVA] or Water Authority of Jordan [WAJ] in Jordan, regional commissariats for agricultural development [CRDAs] in Tunisia, and water basin authorities [ABHs] in Morocco); and (iii) representatives of local stakeholder groups. The role of the Local Water Security Advisory Committee will be to monitor all planning and implementation activities at the local level, and to provide a better link toward national water institutions.

- All project activities, and particularly LWSAP activities, should be fully harmonised with the existing national and regional (including river basin) strategic and regulatory framework. It is therefore advisable to carry out more in-depth analyses of national and regional water strategies and masterplans in countries selected for project implementation and, based on the findings, to supply local project teams with a so-called catalogue of the policies and measures that are provided in those documents in regard to local water security. This would certainly be a useful tool for local water security planning and, at the same time, ensure harmonisation.

- WATER SUM Component 2 should be implemented as follows: (1) in Jordan at the level of category 1 municipalities (governorate centres and any other municipality in which the population exceeds 100,000); (2) in Tunisia at the level of medium-sized municipalities (up to 130,000 inhabitants); (3) in Morocco at the level of municipalities (communes), or urban municipalities (communes urbaines); and (4) in Egypt at the level of cities.

- The selection of local governments to be supported by WATER SUM Component 2 should be open and transparent, based on the criteria listed below. The selection process should be previously discussed with stakeholders at the national and/or regional level.

- Local governments to be included as project partners should be selected using the following criteria:
  - The size of the local community — that is, their area and number of inhabitants. It is advisable to make a balance between bigger and smaller local units.
  - The predominant characteristics of the local community (rural vs. urban municipalities), making a balance between predominantly urban and predominantly rural municipalities.
  - The level of development of the local community: If possible, a balance between developed and underdeveloped local self-governments should be made when selecting local communities.
  - Previous experience with strategic planning and donor assistance programmes. It is recommended that at least half of the selected municipalities should have previous experience with strategic planning and/or donor assistance.
  - The existence of good practices in the municipality. Preference in the selection should be given to municipalities that already have, or that
are already implementing, good practices or projects in water management.

- The existence of local actors capacitated to deal with strategic planning (good local government, good links with regional and central authorities, active and respectable NGOs, public interest etc.).

- Local water security action planning should follow the methodology elaborated in Chapter VI, comprising (1) a water security status assessment; and (2) a planning and implementation phase. It is recommended to apply elements from both the WSSI and CWSI methodologies during the assessment phase, and to use the PDIA approach for the planning and implementation phase.

- It would be very helpful to carefully study experience acquired during similar projects and activities previously carried out in the field (WB and USAID projects in the region, GIZ projects in Jordan and Morocco, the EUWI-MED project, the SWIM-SM project, the EMPOWERS project, etc.) and to have the advice of experts engaged in earlier programmes. Cooperation with similar donor activities should be of crucial importance.

- The LWSAP process should be based on comprehensive stakeholder identification. This phase of the process should be considered very important, given the situation in water management in most of the countries covered by the study, as described below.

- It is recommended to undertake a stakeholder analysis for each country that will be selected to participate in the project, using the methodology provided in this report. The results of such an analysis will form the basis of a stakeholder analysis at the municipal level — that is, the local stakeholder analysis that forms part of the methodology for LWSAP will be carried out more easily and with a considerable unification of results.

- Key players, particularly line ministries in charge of water, must be involved in the process from the very beginning, since they have both great power and a high level of interest, and good links with all other major stakeholders in government, academia and the private sector.

- Governmental authorities are well positioned on the power versus interest diagram, although their relations with other stakeholders should be strengthened. Local governments are quite isolated and do not have direct contacts with other stakeholders dealing with water management. It is necessary to improve their knowledge and skills regarding water management, which should contribute to their better involvement in the process and better connections with other water-related stakeholders.

- In order to secure a successful participatory approach, it is necessary to include stakeholders who are less powerful but who express significant interest (“small players”). Academia is well positioned and is perceived as independent and evidence based, thus it should play an important role regarding information exchange, which is carried out through training and consulting services. Academia can play a better intermediary role as a knowledge broker between all groups of stakeholders. Non-governmental organisations that represent the public interest with regard to environmental concerns have good knowledge of the water management issue and obtain all the crucial information from the main governmental stakeholders. However,
they are not well connected among themselves, thus it is advisable to establish a platform for their cooperation for the purposes of developing LWSAPs, which should also include local NGOs in order to secure the fair representation of local interests. The business sector should be more involved in water management (the majority of businesses are involved at the level of information supply), since businesses have power but are not always interested in water-related issues. The good connections that they have with foreign donors and international organisations should be used as an opportunity to solve local and national water-related problems. One possible way to motivate them to be active players is by establishing public-private partnerships.

- The capacity-building component should be considered as crucial. Local actors should be supplied with various types of training:
  
  o Training of trainers for the facilitators of LWSAP processes. Particular attention should be given to training on action planning and monitoring. Such training should cover facilitation and coaching techniques.
  
  o Training for decision makers in municipalities (municipal senior management team) on water security at the local level. Such training should familiarise top managerial structures with up-to-date facts and achievements in integrated water resources management (IWRM) and water security, and raise their commitment to the concept. The best possible way should be to analyse best practices through a study visit.
  
  o In-service training for local experts and members of working groups. Local experts should be recruited from the region (or from the municipality itself) to work on situation assessment, the definition of priorities, and the development of action plans and projects. They should be supported with methodological training. In addition, in-service training should be provided for members of the working groups.
  
  o Training on project cycle management for municipal offices or officers for development issues. Such training will address deficiencies in project preparation skills.

- Preconditions for eligibility for WATER SUM financial support should be that: (1) the project is defined as a priority in the LWSAP developed by the municipality; (2) there is political commitment, in particular related to building up the required human resources and organisational set-up; (3) the planned projects have reached a mature level of preparation; and (4) suitable sites (for hard investments) are available.

- If and when applicable, ex ante impact analysis and analysis of effectiveness should be provided.

- The budget allocated for the project pipeline is limited and is not currently sufficient to solve complex water security problems in local units. Local governments should be made aware of this from the very beginning of the project and requested to adjust proposals to the available means.

- WATER SUM Component 2 should consider the development of a local water security capacity-building plan in selected municipalities as one of the project activities. The capacity-building plan should be developed around two main
components: (1) the development of “hard” skills — strategy development, management and execution, monitoring and evaluation, project management cycle, data analysis, instruments etc.; and (2) the development of a series of “soft” skills, such as effective communication, public presentation, problem solving, consensus building, negotiations, team building and conflict resolution. Leadership training to support local governments and business and community leaders should therefore be included in the plan.

- It is highly recommended to establish a permanent structure for regional cooperation on local water security, as a seed for future collaboration across boundaries. Project interventions should be tailored to encourage such ways of cooperation. It is advisable to promote existing regional NGOs to act as a forum for local water security, through capacity building and the establishment of various mechanisms for cooperation. Although further research is needed, two regional organisations seem to be suitable for this activity: The Arab Integrated Water Resources Management Network (AWARENET); and the Arab Countries Water Utilities Association (ACWUA).
Chapter I  Introduction

Context of the study

The overall objective of the WATER SUM project is to promote and enhance sustainable water resources management and to promote a comprehensive and integrated approach to water security and ecosystem services for sustainable development in beneficiary countries in the MENA region in order to help halt the downward spiral of poverty, biodiversity loss and environmental degradation.

The project is divided into two components: Component 1, “Water Resources Management Good Practices and Knowledge Transfer” (Water POrT); and Component 2, “Water and Security” (WaSe). The goal of the WaSe component is to promote a comprehensive and integrated approach to water security and ecosystem services for sustainable development in 12 municipalities and their local communities in selected MENA countries as part of efforts to combat water scarcity, reduce the threat of conflicts and increase overall human wellbeing within the wider context of ensuring regional peace and stability.

The present assignment is to carry out an assessment of local water security for improved water management in selected countries in the MENA region. The assessment will be vital in order to plan the project’s implementation phase, and the results of the exercise will form a solid basis for future project activities.

The beneficiary countries relevant for this assessment are Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.

The assessment findings should contribute to:

- an understanding of the interactions between local government institutions and civil society in achieving local sustainable development, as well as conditions enabling improved communication networks and capacity building;
- a proposed methodological approach for building capacity to work jointly with other stakeholders in the community (particularly local governments) towards sustainable development; and
- the development of recommendations for further programme implementation concerning the optimal methodology and localisation of future interventions.

Overview of the methodology

The methodological approach used in this study was determined by the demands stated in the Terms of Reference (see Annex 5).

This study is based on a comprehensive review of the literature on water management and water security issues in four countries in the MENA region. The review encompassed:

- the political, economic and social background of each country, including the specific context of the MENA region;
• an analysis of existing country-based strategic documents and processes, as well as local strategic documents and implementation processes;
• the territorial organisation and administrative structure, with a focus on local communities, local responsibilities and power, the level of decentralisation and the position of local self-governments in each respective country;
• the current situation in the water sector and water use, including water demand use and deficit issues, water governance and governments, and, more specifically, local water management issues; and
• special attention devoted to the analysis of water security drivers and responses, with a focus on climate change, population and urbanisation issues.

In addition to research based on the literature review, the research team visited the region in March and April 2015 and wrote terms of reference for local consultants for carrying out more detailed surveys of local water security in four countries (Jordan, Egypt, Morocco and Tunisia), based on the “Rapid Appraisal” method. The results of these surveys are presented in Annex 1 as case studies. During the field visits, aninterviews were undertaken with representatives of central and local governments and the civil sector. The additional information obtained through these interviews, case studies and personal contacts were key, in most cases, to allowing us to come up with a clearer and more detailed understanding of the current situation and to develop recommendations for further project activities.

The evaluation of the overall performance of selected MENA countries in relation to water security was carried out using selected internationally recognised indicators, described in Annex 3. Countries were ranked using the “Analytical Hierarchical Processes (AHP)” method as a mathematical apparatus. The analysis was performed using AHP software ‘MakeItRational’ (http://makeitrational.com/).

The methodological approach was analysed in relation to a set of criteria — namely scope, scale,applicability, data availability, and financial constraints. Two methodologies for the assessment of water security and four methodologies for the management of water security were selected and analysed. We then offered our recommendations for both an assessment and a management strategy for water security for multiple municipalities.

The stakeholder analysis was carried out using a four-step process (identification of key stakeholders; definition of stakeholder groups; characterisation of stakeholders; and investigation of relationships between stakeholders). For the purposes of this study we used Jordan as an example for the stakeholder analysis. The analysis was based on an online questionnaire, which was further used as a necessary input for assessing relationships between stakeholders.

The water security framework

In 2009, the World Economic Forum (WEF) prioritised water security as a global risk, stating that “water security is the gossamer that links together the web of food, energy, climate, economic growth, and human security challenges that the world economy faces over the next decades’ (WEF 2009). The international water community began using the term “water security” much earlier. During the second World Water Forum in 2000, the concept of water security was introduced in two prominent declarations — (i) the World Water Council (WWC) introduced “A Water
Secure World – Vision for Water, Life and the Environment” (WWC 2000); and (ii) the GWP published “Towards Water Security: A Framework for Action” (GWP 2000). As defined in the GWP declaration, “water security, at any level from the household to the global, means that every person has access to enough safe water at affordable cost to lead a clean, healthy, and productive life, while ensuring that the natural environment is protected and enhanced\(^1\). Water security involves the sustainable use and protection of water systems; protection against water-related hazards (floods and droughts); the sustainable development of water resources; and the safeguarding of (access to) water functions and services for humans and the environment. The Ministerial Declaration of the second World Water Forum, “Water Security in the 21\(^{st}\) Century”, lists seven “main challenges” in achieving water security:

1) meeting basic needs;
2) securing food supply;
3) protecting ecosystems;
4) sharing water resources;
5) managing risks;
6) valuing water and
7) governing water wisely.

Water security arises at two interconnected levels: the local/national level and the regional/international level. At the local/national level, the security of access to the resource is the crucial problem. At the regional/international level, the primary concern is about potential international conflicts and tensions resulting from traditional national security approaches with a focus on hydro-sovereignty. Good water governance is pivotal to achieve water security.

The need for water security is particularly acute in rural and poor communities. Water is critical for economic growth and social wellbeing, thus improved water governance requires an understanding of the social, economic and institutional links between reducing poverty and ensuring access to safe water. The Organisation for Economic Co-operation and Development states that “poverty encompasses different dimensions of deprivation that relate to human capabilities, including consumption and food security, health, education, rights, voice, security, dignity and decent work” (OECD, 2001).

Water security diagnoses include programmes that assess the state and evolution of these seven main challenges. Such an analysis should identify the vulnerabilities of users, sectors and geographical areas, and should reveal causal relationships between human and non-human drivers and water-related consequences. Such information is a prerequisite for any of the priority actions leading to integrating the three Es (equity, economy and environmental sustainability) in water management. It is obvious that to solve water issues that are so strongly related to the allocation (and provision) of

\(^1\) The following definitions of water security were identified: Grey and Sadoff (2007) define water security as the availability of an acceptable quality and quantity of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies. United Nations Water defines water security as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human wellbeing and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UN Water 2013).
scarce water resources, and that are so interdependent at various scales and between sectors, one needs integrated and holistic approaches. Solutions for such complex issues rely heavily on smart integration and coordination. Integrated water resources management (IWRM), with its aim to integrate various physical and social systems, together with governance, with its aim to integrate decision-making processes across scales and levels in a transparent and inclusive way, appear to be the right combination to tackle these issues. Governance is assumed to contribute to the development, implementation and enforcement of equitable, efficient and sustainable solutions for problems related to allocation, provision and coordination. Good governance is assumed to include notions of demand responsiveness and anticipation; consensus-based, social inclusiveness; effectiveness and efficiency; participation, transparency and accountability; and the rule of law (OECD 2011; IMF 2005). The target specifically addresses rule of law notions of governance. Rule of law generally means that independent, efficient and accessible judicial and legal systems are in place, with a government that applies fair and equitable laws equally, consistently, coherently and prospectively to all its people.

Two consequences of the IWRM concept seem to be crucial:

- Firstly, one should ideally have one water law and policy that integrates the various water types and water users. Moreover, national water policies should link with national policies on food security, energy security and climate change adaptation. Additionally, water responsibilities and task should ideally not be fragmented over separated, functional departments and agencies. To avoid this so-called problem of lateral institutional interplay, at the least mechanisms should be in place that allow for interactions between these departments.

- The second relates to the promotion of the subsidiarity principle. According to this principle, a water resources system should ideally be managed at the lowest scale possible. This allows for the generation and implementation of more context-specific solutions supported by local stakeholders. The institutional consequence of this principle is decentralisation and the devolution of water responsibilities from central governmental authorities to lower-order institutions (including non-governmental ones such as NGOs and water users’ associations).

Additionally, IWRM promotes the participation of local stakeholders and specifically encourages the increasing role of women in water-related decision-making processes. Mechanisms and rules have to be in place that enable this decentralisation in order to avoid the problem of vertical institutional interplay, and that foster public participation, especially on the part of women.

**Dimensions of water security**

Water security is not only about having enough water. It involves all issues related to water. In simple terms, water security addresses the “too little”, “too much” and “too dirty” issues of water management. These are the problems that many people face, and that good water management should solve — or at least alleviate. However, water security is far more than this. It is about mitigating water-related risks, such as floods and droughts, addressing conflicts that arise from disputes over shared water resources, and resolving tensions among the various stakeholders who compete for a limited resource. Water is recognised as a central plank of the green economy. It is critical to sustainably managing natural resources and it is embedded in all aspects of development — poverty reduction, food security and health — and in sustaining
economic growth in agriculture, industry and energy generation (van Beek and Arriens 2014).

Water security has three key dimensions — social equity, environmental sustainability and economic efficiency — also known as people, planet and profit.

The economic dimension of water security includes:

• increasing water productivity and conservation in all water-using sectors; and
• sharing economic, social and environmental benefits in managing transboundary rivers, lakes and aquifers.

The social dimension of water security includes:

• ensuring equitable access to water services and resources for all through robust policies and legal frameworks at all levels; and
• building resilience in communities in the face of extreme water events through both hard and soft measures.

The environmental dimension of water security includes:

• managing water sustainably as part of a green economy; and
• restoring ecosystem services in river basins to improve river health.

There are two approaches to addressing water security. One is a developmental approach that seeks to improve water security over time. This approach typically seeks outcomes, in the form of goals and targets, through a combination of policies, reforms and investment projects. The second is a risk-based approach, which seeks to manage risks and reduce vulnerability to shocks resulting from climate variability and water-related disasters (van Beek and Arriens 2014).

Threats to water security

Communities face multiple threats to their water security. Together, these threats have an impact on access to water supplies of sufficient quantity and quality for basic needs. For people who lack access to safe water, the primary problem is rarely one of physical scarcity, in which demand outstrips available supply, but rather of socioeconomic waterscarcity. Water resources may be present but not where or when they are needed most; they may be contaminated, located a great distance from households, or inaccessible because of difficult terrain; or they may have been depleted by uncontrolled abstraction. WaterAid (2012) has identified nine groups of factors as the main treats to water security:

1) weak political will and low institutional capacity to manage water resources and water supply services;
2) social and political exclusion (because of inability to pay, political affiliation, disability, race, caste, gender, age or social status);
3) poverty;
4) low community resilience to cope with stresses on water supplies;
5) poor hygiene and sanitation;
6) rapid population growth and urbanisation;
7) climate change impacts and climate variability;
8) complex hydrogeology and challenging terrain; and
Water security, climate change and water-related climate vulnerability in the MENA region

Why is water security of particular importance for the MENA region?

Firstly, the region as a whole and most of countries are severely exposed to the above-mentioned threats:

- Water is already scarce in the MENA region (this will be further discussed in the following chapters). The region is exposed to both physical water scarcity (limited access to water, caused by water shortage or unsustainable management/overabstraction) and socioeconomic scarcity (society’s economic inability to develop additional water resources or social inability to adapt to the conditions imposed by physical scarcity). This scarcity will only become more pronounced over time due to an increasing population, expected economic growth, and the likely impacts of climate change on water availability and demand.

- Low institutional capacity to manage water resources and water supply services, particularly at the local and community level — namely, water governance deficiencies in MENA countries — include failure to provide sufficient water for poor and marginalised areas, lack of attention to water legislation and infrastructure, and inability to balance competing demands between socioeconomic needs and the environment. This will also be discussed in the following chapters.

- The poverty trap, widely present in the MENA region, makes the issue of water security even more complex. The need for water security is particularly acute in rural and poor communities. Water is critical for economic growth and social wellbeing, thus improved water governance requires an understanding of the social, economic and institutional links between reducing poverty and ensuring access to safe water.

Secondly, the Fourth Assessment Report of the Intergovernmental Panel on Climate Change projects dramatic changes in climate across the MENA region during this century. Under the average climate change scenario, the water shortage in MENA will increase fivefold by 2050—from today’s 42 km³ to approximately 200 km³ (World Bank 2012). Drinking water services will become more erratic than they already are. Cities will come to rely more and more on expensive desalination and on emergency supplies brought by tanker or barge. Service outages will put stress on expensive water networks and distribution infrastructure. In irrigated agriculture, unreliable water services will depress farmers’ incomes and lower productivity. The economic and physical dislocations associated with the depletion of aquifers or the unreliability of supplies will increase. All of these developments will have both short-term and long-term effects on economic growth and poverty, and will increasingly put pressure on public budgets (World Bank 2012). The effects of climate change will also be further discussed in the following chapters.

Given the above, it is clear that a major shift in water policies is required in the MENA region, emphasising conservation and demand management in order to secure long-term water supplies while meeting strict criteria for socioeconomic, financial and environmental sustainability and public health requirements.
Chapter II Country contexts and perspectives in beneficiary countries and the region as a whole

Regional data

The MENA region covers an extensive area, extending from Morocco to Iran, including the majority of both the Middle Eastern and Maghreb countries\(^2\). The term is roughly synonymous with the term “Greater Middle East”. It is an economically diverse region that includes both the oil-rich economies in the Gulf and countries that are resource scarce in relation to population, such as Egypt, Morocco and Yemen.

The MENA region is located between longitudes 13°W and 60°E, and between latitudes 15°N and 40°N, covering a surface area of about 11.1 million km\(^2\) or about 8 percent of the area of the world. Because of the prevailing arid conditions in the region, about 85 percent of the area is desert. The 21 countries in the MENA region have many similarities, although differences in environment, resources and economies exist. Although MENA countries share common identity-formation features — Islam as the main religion and Arabic as a common language — they differ in ethnicity, tradition, history and spoken dialects of Arabic. Economic development strategies also vary between the oil-producing states such as Kuwait and the United Arab Emirates, and the non-oil-producing countries such as Tunisia and Jordan.

The Maghreb sub-region (Northern African countries\(^3\)) extends from the Mediterranean climate zone to the arid zone. Rainfall occurs in the winter season, while the summer season is clear and dry. There are differences in the climate within the sub-region between the Maghreb countries. The Maghreb climate shows a drying and warmer gradient from north to south and a divided and dispersed hydrography with some average-sized rivers only in Morocco. Egypt has an arid climate and a simple hydrography with very limited internal resources and only one river, the Nile, which enters the country from Sudan.

The sub-region of the Middle East as a complete desert climate that is very hot in the summer and relatively cold in the winter, with very scarce rainfall. Finally, the

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\(^2\) There is no standardised definition of MENA: different organisations define the region as comprising different territories. The World Bank considers the following countries as belonging to the MENA region: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, the United Arab Emirates, West Bank and Gaza, and Yemen. Sometimes also included in broader definitions are Armenia, Azerbaijan, Cyprus, Mauritania, Somalia, Sudan, Turkey and Western Sahara.

\(^3\) Northern Africa is generally accepted as referring to the northernmost region of the African continent, stretching from the Atlantic shores of Morocco in the west to the Suez Canal and the Red Sea in the east, including Algeria, Egypt, Libya, Morocco, Sudan, Tunisia and Western Sahara. Northern Africa is not to be confused with North Africa, the definition of which is highly disputed but which, from a political standpoint, is often limited to the four modern countries Morocco, Algeria, Tunisia and Libya. Within Northern Africa lie the smaller region known as Maghreb, consisting of Morocco, Algeria and Tunisia, and known in French colonial times as Afrique du Nord.
Mashreq region (countries like Iran, Iraq, Lebanon and Syria) has a milder and wetter climate compared to the Gulf Cooperation Council (GCC) countries\(^4\).

The population of the region is large and continues to experience significant growth. Currently, the MENA region is home to about 386 million people — that is, 6.3 percent of the world’s population, with an average annual population growth rate of 1.7 percent (World Bank data from 2011). The population more than doubled between 1970 and 2001. Currently, the population of MENA is growing by nearly 7 million people per year, second only to sub-Saharan Africa. Although the region’s total fertility rate (average number of births per woman) declined from 7.0 births per woman in 1960 to above 3.0 births in 2006\(^5\) and is expected to continue to fall, MENA’s population is expected to nearly double in 50 years. About 60 percent of the total population lives in urban areas, but this percentage is on the rise as people migrate to urban areas in search of better economic opportunities. This population growth has been accompanied by rapid and sometimes anarchic urbanisation, with the appearance of large cities with infrastructure that is barely adequate to the needs of the population base, particularly in terms of hygiene and quality of life: drinking water, sewerage, urban waste and air quality.

The MENA region has vast reserves of petroleum and natural gas (810.98 billion barrels, or 60 percent of the world’s oil reserves), and 45 percent of the world’s natural gas reserves (81,237.8 km\(^3\)), which make it a vital source of global economic stability.

The MENA region is the driest and most water scarce region in the world and this is increasingly affecting the economic and social development of most MENA countries. The region has about 0.7 percent of the world’s available freshwater resources. Today, the average per capita water availability in the region is slightly above the physical water scarcity limit, at about 1,076 m\(^3\) per year (compared to the world average of about 8,500). In addition, the MENA region faces other major development challenges. These include a rapidly growing young population, high unemployment rates, and vulnerability to price shocks and climate change. The region also faces some political and security challenges, including extremism.

For the purposes of this study, the following countries will be analysed: Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.

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\(^4\) Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

\(^5\) Of the 10 biggest examples of decline in total fertility rates in the post-war era, five (Oman, Iran, Kuwait, Algeria and Libya) have occurred in MENA countries. Total fertility rates of nationals in Bahrain, Iran, Lebanon, Qatar and Tunisia are already at or below the replacement level of 2.1; at the high end, only four MENA countries — namely, Syria, Jordan, Iraq and Yemen — now have fertility rates above 3.
### Table 1. Geo-social data for countries covered by the study

<table>
<thead>
<tr>
<th></th>
<th>Algeria</th>
<th>Egypt</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Libya</th>
<th>Morocco</th>
<th>Syria</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land area</strong></td>
<td>km$^2$</td>
<td>2,381,741</td>
<td>1,001,450</td>
<td>92,300</td>
<td>10,452</td>
<td>1,759,540</td>
<td>446,550</td>
<td>185,180</td>
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<tr>
<td><strong>Agricultural land</strong></td>
<td></td>
<td>17.4</td>
<td>3.6</td>
<td>10.9</td>
<td>67.2</td>
<td>8.8</td>
<td>67.3</td>
<td>75.7</td>
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<tr>
<td>Percentage of land area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Forest land</strong></td>
<td>Million</td>
<td>1.7</td>
<td>0.1</td>
<td>1.0</td>
<td>13.3</td>
<td>0.1</td>
<td>8.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Percentage of land area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>Million</td>
<td>37.8</td>
<td>86.9</td>
<td>6.4</td>
<td>4.1</td>
<td>6.5</td>
<td>33.1</td>
<td>21.9</td>
</tr>
<tr>
<td><strong>Population density</strong></td>
<td>Inhabitants/km$^2$</td>
<td>14.8</td>
<td>78.7</td>
<td>70.1</td>
<td>409.1</td>
<td>3.7</td>
<td>71.4</td>
<td>121.5</td>
</tr>
<tr>
<td><strong>Annual population growth</strong></td>
<td>Percent</td>
<td>2.4</td>
<td>2.3</td>
<td>1.6</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>Urban population</strong></td>
<td>Percent</td>
<td>73</td>
<td>43.5</td>
<td>82.7</td>
<td>87.2</td>
<td>77.7</td>
<td>56.7</td>
<td>56.1</td>
</tr>
<tr>
<td><strong>Urbanisation rate</strong></td>
<td>Percent, est. (2005–2010)</td>
<td>2.5</td>
<td>1.8</td>
<td>3.1</td>
<td>1.2</td>
<td>2.2</td>
<td>1.8</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Human development index</strong></td>
<td>Value (2013)</td>
<td>0.717↑</td>
<td>0.682↑</td>
<td>0.745↑</td>
<td>0.765↑</td>
<td>0.784↓</td>
<td>0.617↑</td>
<td>0.658↑</td>
</tr>
<tr>
<td><strong>Poverty ratio</strong></td>
<td>USD 1.25/a day, PPP</td>
<td>6.8$^6$</td>
<td>1.7</td>
<td>0.1</td>
<td>N/A</td>
<td>N/A</td>
<td>2.5</td>
<td>1.7$^7$</td>
</tr>
<tr>
<td><strong>Poverty ratio</strong></td>
<td>Percent below nat. pov. line</td>
<td>14.3</td>
<td>25.2</td>
<td>14.4</td>
<td>N/A</td>
<td>N/A</td>
<td>9.0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

$^6$ Data for 1995

$^7$ Data for 2004
Individual country overviews

Algeria

Algeria is an upper-middle-income country, the largest of the North African countries, covering 2,381,741 km² with 1,200 km of Mediterranean coastline, stretching from the Moroccan border to the Tunisian border. It is also the largest country on the African continent after Sudan. However, only about one-eighth of this vast country is fertile enough to sustain life. The country is bordered in the north-east by Tunisia, in the east by Libya, in the west by Morocco, in the south-west by Western Sahara, Mauritania and Mali, in the southeast by Niger, and in the north by the Mediterranean Sea.

The population of Algeria is 37.8 million (January 1, 2013), with an annual growth rate of 2.4 percent and a density of 15.9 inhabitants per km². In terms of age structure, the country has a predominately young population (46.7 percent of the population is under 24; only 5.46 percent are over 65). Ninety-one percent of the Algerian population lives along the Mediterranean coast on 12 percent of the country’s total land mass. The urban population represents 66.5 percent of the total, and urbanisation continues, despite government efforts to discourage migration to the cities. Currently, 24 million Algerians live in urban areas; about 1.5 million nomads live in the Saharan area. Ninety-nine percent of the population is classified ethnically as Arab-Berber and religiously as Sunni Muslim. The Berbers are divided into many groups with varying languages. The largest of these are the Kabyles, who live in the Kabylia Mountains east of Algiers; the Chaoui of north-east Algeria; and the Tuaregs in the southern desert.

Algeria has a literacy rate of 69.9 percent for the total population, and a female literacy rate of 61 percent. Life expectancy in 2013 was 72.68 for women and 69.42 for men.

Northern Algeria lies within the temperate zone, and its climate is similar to that of other Mediterranean countries, although the diversity of the relief provides sharp contrasts in temperature. The coastal region has a pleasant climate, with winter temperatures averaging from 10°C to 12°C and average summer temperatures ranging from 24°C to 26°C. Rainfall in this region is abundant — 38 to 69 cm per year and up to 100 cm in the eastern part, with occasional heavy rains that can result in flooding. Further inland, the climate changes; winters average 4°C to 6°C, with considerable frost and occasional snow on the massifs; summers average 26°C to 28°C. In this region, prevailing winds are westerly and northerly in winter and easterly and north-easterly in summer, resulting in a general increase in precipitation from September to December and a decrease from January to August. There is little or no rainfall in the summer months. In the Sahara Desert, temperatures range from –10°C to 34°C, with extreme highs of 49°C. There are daily variations of more than 44°C. Winds are frequent and violent. Rainfall is irregular and unevenly distributed.

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8 Excluding some 200,000 Ibadis in the M'zab Valley in the region of Ghardaia.
**Egypt**

Egypt is a lower-middle-income country, the 16th most populous in the world, occupying 1,001,450 km² (nearly 3 percent of the total area of Africa). Most of the country lies within the wide band of desert that stretches eastwards from Africa’s Atlantic Coast across the continent and into South-West Asia. Only 35,000 km² of the total land area is cultivated and permanently settled. The Nile Valley and Nile Delta (3.6 percent of the total area) are the most important regions, being the country’s only cultivable regions. The Western Desert covers an area of some 700,000 km², accounting for 68 percent of Egypt’s total land area. This immense desert to the west of the Nile occupies the area from the Mediterranean Sea southwards to the Sudanese border. The Eastern Desert covers an area of approximately 220,000 km² (22 percent of the total area) and is relatively mountainous and uninhabited. The Sinai Peninsula is a triangular-shaped peninsula, occupying about 61,100 km².

The population of Egypt is 86.9 million, with an annual population growth rate of 2.3 percent. The population is expected to be 104 million by 2025, 146 million by 2050, and 237 million in 2100. Currently, 43.5 percent of the population live in cities, and this proportion is growing. Nearly 97 percent of the population live in three major regions of the country: Cairo and Alexandria, elsewhere along the banks of the Nile Valley and the Nile Delta, and along the Suez Canal. These regions, which occupy about 4 percent of the country’s area, are among the world’s most densely populated regions, where the population density is about 1,500 inhabitants per km². Small communities spread throughout the desert regions of Egypt are clustered around oases and historical trade and transportation routes.

The vast majority of the population of Egypt consists of ethnic Egyptians (99.6 percent). Ethnic minorities in Egypt include the Bedouin Arab tribes of the Sinai Peninsula and the Eastern Desert, the Berber-speaking community of the Siwa Oasis, and the Nubian people clustered along the Nile in the southernmost part of Egypt.

Life expectancy has increased from 52 years in 1960 to 72 years today. The overall literacy rate in Egypt was 73.9 percent in 2013, and the female literacy rate was 66.8 percent.

Egypt’s climate is hot and dry, and is getting warmer. The average daily temperature ranges from 17°C to 20°C along the Mediterranean coast, to more than 25°C in Upper Egypt along the Nile. From 1961 to 2000, the mean maximum air temperature increased 0.34°C per decade, while the mean minimum air temperature increased 0.31°C per decade. Rainfall is very low, irregular and unpredictable.

**Jordan**

Jordan is a small upper-middle-income country with a total area of 92,300 km². It shares borders with Syria to the north, Iraq to the east, Saudi Arabia to the south, and Israel and the Occupied Palestinian Territory to the west. Three-quarters of the total area of Jordan is sparsely populated desert.

The population of Jordan is 6.388 million (2012). As is the case in the majority of MENA countries, the population is young (one of the youngest among upper-middle-income countries), with 37.3 percent of inhabitants below the age of 15. Conversely, there is a very small older population, with only 3.2 percent of the population over 65. The average
family size is 5.4 people. The urban population represents 82.6 percent of the total, with the majority (71.5 percent) concentrated in the country’s three largest urban areas (15.7 percent of the total area of Jordan): Central Amman, Zarka and Irbid governorates. Rapid population growth continues to pose a major challenge for Jordan’s development. Between 1979 and 2010, the population grew from 2.1 million to 6 million (an 86 percent growth, compared to 39 percent growth in Lebanon, 56 percent growth in Israel and 67 percent growth in Syria), and at the current growth rate the population of Jordan is expected to double in about 30 years, from 6.5 million at present to 13.2 million in 2040.

Native Jordanians (92 percent Sunni Muslims) are mostly descended from village dwellers and Bedouins originating in the Arabian Peninsula. Half of Jordan’s population is of Palestinian origin. In addition, there are minorities such as Circassians, Chechens, Armenians and refugees such as Iraqis, Syrians and Assyrians. There are also hundreds of thousands of guest workers from Egypt, Syria, Indonesia and South Asia, who are domestic and construction employees.

Jordan has an adult literacy rate of 95.9 percent for the total population. Life expectancy at birth was 73.4 in 2011.

The climate is influenced by Jordan’s location between the subtropical aridity of the Arabian Desert areas and the subtropical humidity of the eastern Mediterranean area. The western highlands of Jordan have a Mediterranean climate, with hot, dry summers and cool, wet winters. The rest of the country is mainly arid, with a dry climate that is hot in summer and cold in winter.

**Lebanon**

Lebanon is an upper-middle-income country covering 10,452 km². It is located in the Near East, to the west of Asia, and its western frontier is the Mediterranean coast. To the north and east, Lebanon borders on semi-desert lands in Syria, and to the south it has a short frontier with Israel. It is a fairly mountainous country. It can be divided into four main structural units from west to east: (1) a fairly narrow coastal strip where most of the main towns are located; (2) the Lebanon Mountains, a limestone mass reaching above 3,000 m; (3) the Bekaa synclinal depression; and (4) the Anti-Lebanon Mountains, forming the natural border with Syria.

The Lebanese population was estimated at around 4.1 million, with an additional 260,000 Palestinians (approximate figures in 2009) living in camps, and other migrant workers. As in the other Middle East countries, the population in Lebanon is young (with 34.3 percent under 20), and highly urbanised (87.2 percent). The annual population growth rate is 1.0 percent. Lebanon is the most densely populated country in the MENA region, with 409 inhabitants per km². Approximately 49 percent of the population live in Lebanon’s middle regions, consisting of the governorates of Beirut and Mount Lebanon (including the southern suburbs of Beirut), while the rest of the population is distributed among the remaining three governorates (20.3 percent in North Lebanon, 13.0 percent in Bekaa, and 17.6 percent in South Lebanon, including Nabatiyeh). The main cities are Beirut, Tripoli (the capital), Saida, Jounieh, Zahle and Tyre. The majority of the Lebanese population is Arabic (95 percent), with 4 percent Armenians. The Muslim population is 54 percent (27 percent Sunni and the same percent of Shia), and the Christian population is 40 percent. However, many Lebanese Christians do not identify themselves as Arab, but rather as
descendants of the ancient Canaanites, and prefer to be called Phoenicians. Estimated life expectancy at birth for 2014 was 77.2 years.

Two factors influence the climate of Lebanon: relief and proximity to or distance from the sea. A distinction can therefore be made between the coastal climate, which is fairly moist and warm, with very Mediterranean characteristics; the mountain climate, with cold winters and frequent frost; and, further to the east, the arid, dry climate. The average annual temperature is 20°C on the coast (ranging from 13°C in winter to 27°C in summer), 16°C in the Bekaa Valley (ranging from 5°C in winter to 26°C in summer) and less than 10°C at higher elevations in the mountain zones (ranging from 0°C in winter to 18°C in summer). Average annual rainfall is estimated at around 800 mm, varying from 600 to 900 mm along the coastal zones to 1,400 mm on the high mountains and decreasing to 400 mm in the eastern parts and less than 200 mm in the north-east. Above 2,000 m, precipitation helps to sustain a base yield for about 2,000 springs during the dry period. Rainfall occurs on 80 to 90 days a year, mainly between October and April. About 75 percent of the annual stream flow occurs in the five-month period from January to May, 16 percent from June to July, and only 9 percent in the remaining five months from August to December. In Beirut, annual rainfall is 800 to 900 mm and average temperatures in January and August are 14.4°C and 25.6°C, respectively. The synclinal depression is much drier, with less than 400 mm of rain a year.

Libya

Libya is located in North Africa, with a total land area of 1,759,540 km². The country borders Algeria, Chad, Egypt, Niger, Sudan and Tunisia, and has 1,900 km of coastline along the Mediterranean Sea. The country occupies a huge area of the African Sahara, with an elevation of between 200 and 300 m above sea level. Some 90 percent of the country is sparsely populated and human activities are concentrated in oases. There are several highlands in the northern area, Jabal Nafusah in the north-west and Jabal al-Akhdar in the north-east, with maximum elevations of 980 m and 800 m respectively. The highest mountain in the country, located in the largely empty southern desert near the Chadian border, is the Tibesti, which rises to 3,400 m above sea level. A relatively narrow coastal strip and the highland steppes immediately south of it are the most productive agricultural regions. The main cities are concentrated in the northern part of the country along the coastal area.

The total population is 6.5 million, with a population density of 3.7 persons per km². The northern part of the country is the most populous, with 85 percent of the population on 10 percent of the country’s territory. According to the general census in 2006, the population growth rate fell from 2.9 percent to 1.8 percent during the period 1984–1995, and further to 1 percent today. Similarly, the percentage of the population under 15 years of age declined from 39 percent in 1995 to 32 percent in 2006. The proportion of the population over 60 years of age is 6 percent. The urban population is 77.7 percent of the total, and the annual growth rate in urban areas is much higher than in rural areas.

The climate in Libya is Mediterranean along the coast, which basically consists of four seasons. It is dry and hot in the extreme desert interior, with the exception of Sabha in the south.
Prior to the 2011 conflict, Libya was recognised as an upper-middle-income country, and it has made good economic and social progress in the last several decades. The country has enjoyed favourable social indicators: its Human Development Index was 0.840 in 2008, which gives the country a ranking of 52\textsuperscript{nd} out of 179 countries. At the same time, there has been steady progress in indicators such as life expectancy, health and reproductive care, water supply, sanitation, and educational attainment.

**Morocco**

Morocco is a lower-middle-income country that occupies 446,550 km\(^2\) on the north-west coast of Africa. The country is characterised by a fertile coastal plain on the Mediterranean Sea and, in the west of the country, wide coastal plains facing the ocean and bounded by the Er Rif and Atlas mountain ranges. The Atlas Mountains extend across the country from south-west to north-east. South of the Atlas Mountains, semi-arid grasslands merge with the Sahara Desert.

The total population of Morocco is 33,069,934 (July 2013 estimation), with an annual population growth rate of 1.04 percent (2013 estimation), and urbanisation taking place at a rate of almost 2 percent per year. The population is nearly evenly split between rural and urban areas. The Moroccan population is growing at a rate of 1 percent annually. Internal migration processes enhance urbanisation processes, particularly in the coastal areas of the country.

Morocco has a literacy rate of 67 percent. Life expectancy in 2013 was 74.4 for women and 70.2 for men.

Arab-Berbers constitute 99.1 percent of the total population. Berbers, who comprise a little more than 33 percent of the population, are concentrated largely in the northern regions of the Rif, the middle plains of the Atlas, and the Sous Valley. Arabs, who constitute about 66 percent of the population, are distributed principally along the Atlantic coastal plain and in the cities.

Along the coast of the Mediterranean Sea the climate is warm, with dry summers and mild winters. Inland, the climate is more severe, getting hotter and more extreme closer to the Sahara Desert. Typically, there are two rain periods per year, one in the fall and one in winter. The number of rainy days varies from about 30 in the south of the country to near 70 in the north.

**Syria**

Syria lies in Western Asia, bordering Lebanon and the Mediterranean Sea to the west, Turkey to the north, Iraq to the west, Jordan to the south, and Israel to the south-west. It is divided by a double band of mountains from the large eastern region, primarily a semi-arid to arid plateau that encompasses mountain ranges, desert areas, and the Euphrates River basin. In the north-west, the Jabal al Nusayriyah mountain range, with peaks averaging 1,212 m, runs parallel to the coastal plain, terminating just north of the Lebanese border. It consists mostly of arid plateau, although the north-west part of the

\(^9\)Excluding Western Sahara.
country bordering the Mediterranean is fairly green. The north-east of the country (Al Jazira) and the south (Hawran) are important agricultural areas. The Euphrates, Syria’s most important river, crosses the country in the east, providing 80 percent of Syria’s water resources.

The total population, before the conflict that has caused the world’s biggest humanitarian and security disaster, was nearly 22 million, exhibiting a high annual growth rate of 5.6 percent. In 2004, about 38 percent of Syrians were less than 15 years of age, 58.7 percent between 15 and 64 years of age, and 3.3 percent 65 and older. Syria was one of the most densely populated countries in the Middle East (57 people per km² in 1986 and about 363 per km² in 2004), but there are significant regional variations. Most people live in the Euphrates River Valley and along the coastal plain, a fertile strip between the coastal mountains and the desert. Syria hosted nearly 1.8 million refugees and asylum seekers (1.3 million from Iraq and 543,400 from Palestine). However, during and after the Syrian Civil War in March 2011, almost 9 million Syrian people have become displaced as well. Currently, the number of refugees in neighbouring countries, originating from Syria, is over 3.1 million, mostly in Lebanon (1.15 million), Turkey (1 million) and Jordan (620,000).

A country of fertile plains, high mountains, and deserts, it is home to diverse ethnic and religious groups alongside the majority Arab population. Other ethnic groups include Aramean-Syrian Christians, Armenians, Assyrians, Kurds and others. Sunni Arabs are the largest population group.

The literacy rate among Syrians aged 15 and older is 90.7 percent for men and 82.2 percent for women.

The climate in Syria is dry and hot, and winters are mild. Because of the country’s elevation, snowfall does occasionally occur during winter. A semi-arid steppe zone extends across about three-quarters of the country between the humid Mediterranean coast in the west and the arid desert regions to the south and east. The steppe experiences fairly abundant rainfall, with annual precipitation ranging between 750 and 1,000 mm, mostly falling between November and May. Annual mean temperatures range from 7.2°C in January to 26.6°C in August. The area east of the Anti-Lebanon Mountains, including Damascus, has precipitation averaging less than 200 mm a year and temperatures ranging from 4.4°C in January to 37.7°C in July and August. Syria’s major environmental issues include deforestation, overgrazing, soil erosion, desertification, water pollution from the dumping of raw sewage and waste from petroleum refining, and inadequate supplies of potable water.

_Tunisia_

Tunisia is a small, upper-middle-income country located on the southern coast of the Mediterranean in North Africa. It is the northernmost country on the African continent, and the smallest of the nations situated along the Atlas mountain range. It occupies an area of 155,360 km² and is bordered by Libya to the east and Algeria to the west. Around 40 percent of the country is composed of the Sahara Desert, with much of the remainder consisting of particularly fertile soil and a 1,300 km coastline.
In 2012, the population of Tunisia was estimated at 10.7 million, exhibiting an annual growth rate of 0.90 percent. Tunisia’s population is young, with 23 percent of the population under the age of 15, an estimated 55 percent under the age of 24, and the majority of the population concentrated in the northern districts of the country, along the Mediterranean coast, and in the capital city, Tunis. The population is urbanised, with 66 percent residing in cities. The arid interior of the country to the south and west is less populated due to the desert climate and scarcity of water resources.

Some 98 percent of modern native Tunisians are from a sociological, historical and genealogical standpoint mainly of Arab and Berber descent, but the overwhelming majority simply identify themselves today as Arabs. Islam is the official religion, but the country has a secular culture that encourages acceptance of other religions and religious freedom.

The total literacy rate among Tunisians aged 15 and older is 79.1 percent. The average expected lifetime is 75.6 years (2012).

Because of its geographical location, Tunisia’s climate is influenced by the Mediterranean Sea in the north and by the Sahara in the south, while central Tunisia’s climate is influenced by a combination of both. Overall, the climate is largely characterised by aridity, with 94 percent of the land directly threatened by desertification.

### Political, economic and social context

Countries in the MENA region share several cultural, historical and geographical traits, but also many marked differences, two of the most notable being the availability or lack of hydrocarbon resources in their territories and the size of their native populations. Based on this, MENA economies can be classified in three main groups:

- **Resource-rich, labour-abundant countries** are producers and exporters of oil and gas and have large native populations that represent almost the totality of their residents (Algeria, Iraq, Syria and Yemen).
- **Resource-rich, labour-importing countries** are producers and exporters of oil and gas and have large shares of foreign or expatriate residents that represent a significant percentage of the total population, and even the majority in some cases (GCC members and Libya).
- **Resource-poor countries** are small producers or importers of oil and gas. (Djibouti, Egypt, Jordan, Lebanon, Mauritania, Morocco, Tunisia and the Palestinian Territories).

The availability of hydrocarbons (nearly 60 percent of the 1.4 trillion barrels of proven crude oil reserves and 46 percent of the 192 trillion standard cubic metres of natural gas reserves) and the size of the population have important implications for the economic features and performance of MENA countries. Hydrocarbons are an important source of government revenue, exports and economic activity, but oil dependence has also been

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10 Based on the World Bank’s denotations of resource-poor, labour-abundant countries; resource-rich, labour-abundant countries; and resource-rich, labour-importing countries.
translated into low levels of economic diversification and high volatility in resource-rich countries. High levels of dependence on hydrocarbon production and exports have been inevitably reflected in the economic performance of resource-rich countries. On the contrary, resource-poor countries have relatively more diversified and less volatile economies than resource-rich countries.

These comparatively higher levels of economic diversification in resource-poor countries have been accompanied by relatively high and stable economic growth, although at lower levels than the average in emerging markets. During 2000–2010, all countries in this subgroup (Egypt, Jordan, Lebanon, Morocco and Tunisia) grew at average annual rates ranging from 4.5 to 6 percent, similar to those of resource-rich, labour-importing countries. However, greater levels of economic diversification and economic growth during the last 10 years have not led to an improvement in the living standards of the population. A bloated and inefficient public sector and a narrow private sector have not been able to reduce the high levels of unemployment that have affected MENA countries for several years (MENA-OECD Investment Programme, 2011).

Currently, the MENA region is witnessing a turning point. The key political challenges in the region include the Arab–Israel dispute in the Middle East, Iran’s foreign affairs and regional politics, civil wars in Libya and Syria, and the social awakening in the MENA region that has given birth to newly elect political leadership (Muslim Brotherhood). The social and political protests and transformations set off in Tunisia in late 2010 and early 2011 spread to several countries in what has been dubbed the Arab Spring. The main drivers of protests were of a structural nature, notably economic and socio-political factors that influence and strengthen each other and that explain why the fairly positive macroeconomic performance of many countries in the region has not been translated into better living standards and prospects for the majority of their populations. One of those
structural factors is the lack of economic opportunities, which is mainly expressed in high levels of unemployment and underemployment that mostly affect young people, women and the highly educated. Another main driving factor of the Arab Spring is the lack of political freedoms and representation, which is accompanied by pervasive corruption, a lack of transparency and cronyism. This factor is translated into strong and long-lasting regimes ruled by narrow elites, which, in many cases, politically and economically benefit a group of well-connected people or families at the expense of the majority.

Political and regional dynamics continue to shape economic developments across the MENA region, especially in resource-poor countries and Libya. Political risks are among the highest across emerging and developing regions. The region is teetering on the verge of socioeconomic repression due to a cocktail of climate change effects, economic challenges, and post-Arab Spring political instability, even in countries that had their regimes toppled. The population of the region is increasing at an unprecedented rate, the unemployment rate is overwhelming, and poverty and high food prices suppress the poor (Zyadin 2013). The intensifying conflict in Syria and political developments in Egypt and Tunisia have heightened concerns of wider destabilisation. Spill-overs from these countries, as well as bouts of social unrest and escalating security concerns, complicate economic management. Across the region, investment is restrained, deterred by socio-political uncertainties and the lack of a credible medium-term policy agenda. Domestic activity is sustained by consumption, which, in turn, is underpinned by large public wage bills, energy subsidies, and remittances, mostly from Europe and the GCC. Table 2 shows the current comparative economic indicators in the analysed MENA countries.
Table 2. Comparative economic indicators

<table>
<thead>
<tr>
<th></th>
<th>Algeria</th>
<th>Egypt</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Libya</th>
<th>Morocco</th>
<th>Syria</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (2013) USD bn. at PPP (WB data)</td>
<td>522</td>
<td>910</td>
<td>76</td>
<td>77</td>
<td>133</td>
<td>242</td>
<td>N/A</td>
<td>121</td>
</tr>
<tr>
<td>GDP per capita USD at PPP</td>
<td>13,304</td>
<td>11,085</td>
<td>11,782</td>
<td>17,170</td>
<td>21,397</td>
<td>7,200</td>
<td>N/A</td>
<td>9.900</td>
</tr>
<tr>
<td>Disposable income per household (2010)&lt;sup&gt;13&lt;/sup&gt; USD per household, at constant 1995 prices</td>
<td>7,372</td>
<td>5,758</td>
<td>9,333</td>
<td>N/A</td>
<td>N/A</td>
<td>7,904</td>
<td>N/A</td>
<td>10,621</td>
</tr>
<tr>
<td>Disposable income per household (2010) Percent of change 1995–2010</td>
<td>21.5</td>
<td>36.6</td>
<td>46.1</td>
<td>N/A</td>
<td>N/A</td>
<td>32.4</td>
<td>N/A</td>
<td>49.9</td>
</tr>
<tr>
<td>Budget balance (2012) percent</td>
<td>-5.1</td>
<td>-10.7</td>
<td>-8.8</td>
<td>-9.0</td>
<td>19.3</td>
<td>-7.6</td>
<td>-7.8&lt;sup&gt;12&lt;/sup&gt;</td>
<td>-6.5</td>
</tr>
<tr>
<td>Current account balance (2012) percent of GDP</td>
<td>5.9</td>
<td>-3.1</td>
<td>-18.1</td>
<td>-16.2</td>
<td>29.2</td>
<td>-10.0</td>
<td>N/A</td>
<td>-8.1</td>
</tr>
<tr>
<td>Unemployment rate (2013) percent</td>
<td>9.9</td>
<td>13.1</td>
<td>12.2</td>
<td>8.9</td>
<td>N/A</td>
<td>9.5</td>
<td>N/A</td>
<td>15.3</td>
</tr>
<tr>
<td>Consumer price inflation (2012) percent</td>
<td>8.9</td>
<td>7.8</td>
<td>4.8</td>
<td>6.6</td>
<td>6.1</td>
<td>1.3</td>
<td>4.4&lt;sup&gt;13&lt;/sup&gt;</td>
<td>5.6</td>
</tr>
<tr>
<td>Poverty ratio (USD 1.25/day, PPP)</td>
<td>6.8&lt;sup&gt;14&lt;/sup&gt;</td>
<td>1.7</td>
<td>0.1</td>
<td>N/A</td>
<td>N/A</td>
<td>2.5</td>
<td>1.7&lt;sup&gt;15&lt;/sup&gt;</td>
<td>0.7</td>
</tr>
<tr>
<td>Poverty ratio Percent below nat. pov. line</td>
<td>14.3</td>
<td>25.2</td>
<td>14.4</td>
<td>28.6</td>
<td>N/A</td>
<td>9.0</td>
<td>N/A</td>
<td>15.5</td>
</tr>
</tbody>
</table>

<sup>11</sup>Source: World Consumer Income and Expenditure Patterns, 12<sup>th</sup> Edition, www.euromonitor.com; IMF Regional Economic Outlook. Middle East and Central Asia
<sup>12</sup>Data for 2010
<sup>13</sup>Data for 2010
<sup>14</sup>Data for 1995
<sup>15</sup>Data for 2004
Although the political situation in the region is fragile and constantly changing, it can be said that currently Morocco, Tunisia, Jordan and Egypt are the “most advanced” in the transition process. Jordan and Morocco are undertaking political reforms intended to strengthen the government’s powers. North African countries are experiencing the middle-income-country trap, with economic growth performance constrained and undermined by limited economic transformation towards higher value-added production and insufficient political, social and economic inclusion. The regional average growth rate of 3.8 percent in North African countries in 2013 (excluding Libya, that had a negative growth rate in 2013) is close to the average growth rate in Africa, which is around 4 percent — a performance superior to that of the world economy (3 percent) in 2013 and one that emphasises the resilience of the continent. Libya is emerging from a violent revolution and is still very fragile. In Syria, important levels of confrontation and instability make it very difficult to discern likely trends in the short to medium term. Youth unemployment, poverty and regional disparities, migration, the increase of Islamic activism, urban violence and civil unrest, traffic injuries, and the slow transformation of economic structures are among the most important challenges to address in a drive towards stronger and more inclusive growth in the region.

The MENA region also faces growing challenges from environmental stresses, resulting from population pressures, urban growth, water scarcity and pollution, desertification (the second highest ratio of desert after the Arabian Peninsula, at over three-quarters of the land) and climate change exacerbating water shortages. This also matters for the future security and stability of the region. Economic growth in the region, while increasing revenues and demographic pressure, has given rise to increasing environmental problems. The degradation of water, soil and air quality, the overexploitation of water resources, waste management and the common disposal of waste in uncontrolled landfills are beginning to be regarded as potential threats to human health and wellbeing. The poor, who depend more directly on natural services, are commonly the first sector of society to suffer from the declining availability of natural resources and from environmental damage.

Despite conditions of water scarcity and a dramatic shrinkage in per capita renewable water resources in recent decades, MENA countries have made progress in providing improved water and sanitation to their populations (see Annex 4). Urban access to improved water and sanitation is relatively high in North African countries, nearly universal in Jordan, Lebanon, Morocco and Tunisia, and high in Egypt. Algeria, Libya and Syria, however, may miss their Millennium Development Goal target for water and sanitation as the result of a decline in the proportion of people with access to water.

**Algeria**

Constitutionally, Algeria is defined as a people’s democratic republic, one and indivisible with the people constituting the source of any power. Its system of representation of the people “has no limits except those defined by the Constitution and the electoral law”. The head of state is the president, directly elected for a five-year period. The Council of Ministers is presided over by the prime minister, who is appointed by the head of state.

Algeria boasts significant natural resources. It is primarily an oil- and natural gas–producing country (Algeria has the eighth largest reserves of natural gas in the world and
is the fourth largest gas exporter; it ranks 16th in oil reserves), although it also has iron, uranium, zinc, gold, phosphate and tungsten reserves, among others. However, oil and natural gas constitute its main sources of revenue (oil production of 1.45 million barrels per day; hydrocarbons accounting for roughly 60 percent of budget revenues, 30 percent of GDP, and over 95 percent of export earnings). The economy remains dominated by the state, a legacy of the country’s socialist post-independence development model. Gradual liberalisation since the mid-1990s has opened up more of the economy, but in recent years Algeria has imposed new restrictions on foreign involvement in its economy and largely halted the privatisation of state-owned industries.

Thanks to strong hydrocarbon revenues, Algeria has a cushion of USD 205.2 billion in foreign currency reserves and a large hydrocarbon stabilisation fund. In addition, Algeria’s external debt is extremely low at about 1.7 percent of GDP. However, Algeria is ecologically vulnerable, with fragile ecosystems subject to drought and desertification, rapid coastal erosion and chronic water stress in certain regions. It is also economically vulnerable, with its economy based on a single export — hydrocarbons. Unemployment has remained at about 10 percent since 2010, and is significantly higher among young people (24.8 percent) and women (16.3 percent).

**Egypt**

Egypt is a presidential republic with a unicameral People’s Assembly (*Majlis al-Shaab*) and Consultative Council (*Majlis al-Shuwra*), composed of 140 elected and 70 appointed members. The country is under a limited multiparty system formally adopted by a constitutional amendment approved in a referendum in 1980. Executive power is vested in the president, who is nominated by the People’s Assembly and elected for a six-year term by popular referendum. Following the Egyptian Revolution of 2011 and the resignation of President Hosni Mubarak, executive power in Egypt was assumed by the Supreme Council of the Armed Forces, which dissolved the parliament and suspended the constitution in 2012. The new Egyptian Constitution was promulgated in 2014, defining Egypt as a democratic republic.

The service sector accounts for half of the Egyptian economy, with industry providing 37 percent of economic activity and the agricultural sector roughly 14 percent. However, agriculture is the second largest employer in the country. With virtually all agricultural jobs located in rural areas, agriculture employs about half the working population in those rural areas. Tourism is a growing sector of Egypt’s economy, accounting for 11.3 percent of GDP.

Egypt is a developing country with a growing population and a growing economy. GDP per capita is slightly above USD 11,000, which has grown at an average annual rate of 4 percent since 2005. Between 2007 and 2008, the Egyptian economy grew by over 7 percent (per capita income has increased by more than 3 percent per year in that time), but dropped during 2009 to a rate just over 5 percent. However, Egypt has the largest population of any MENA country, and wide income disparities require government intervention in the form of substantial subsidies for food, housing and energy. This results in a relatively low current disposable income per household of about USD 5,758.

Although incomes on average have increased, there is widespread poverty in Egypt. Two percent of the overall population (1.7 million people) live under the USD 1.25/day income
poverty line, and 38 percent live below the USD 2/day income poverty line (World Bank 2011). Seven out of 10 people living in poverty live in rural areas. Egypt has reduced extreme poverty, but total poverty has increased in recent years. Even within rural areas there are geographical disparities, with two-thirds of the extreme poor living in Upper Egypt.

Jordan

Being one of the most liberal countries in the Middle East, with a secular government, Jordan is a constitutional monarchy, ruled by H.M. King Abdullah II. Executive power is vested in the Council of Ministers, which is appointed by the king. The Council of Ministers is answerable to a two-house parliament, comprising an upper house (the Senate) with 55 appointed senators, and a lower house of 110 deputies elected by popular vote. The 2010 Index of Globalization ranked Jordan as the most globalised country in the MENA region. The proportion of skilled workers is among the highest in the region.

Jordan is classified as an upper-middle-income country, with a per capita GDP of USD 4,912, and with an economy that is constrained by limited arable land and scarce water resources. However, post-2000 Jordan is often classified as an emerging market. The rapid privatisation of previously state-controlled industries and the liberalisation of the economy resulted in a boom that continued through 2009. Jordan has a developed banking sector that attracts investors due to conservative bank policies that enabled the country to weather the global financial crisis of 2009. Jordan’s economy has been growing at an annual rate of 7 percent for a decade. The economy grew steadily from 1999 to 2006, when GDP growth peaked at 8.0 percent. This period of growth led to a subsequent drop in poverty rates between 1997 (9.8 percent) and 2006 (6.1 percent). However, the global economic slowdown and regional turmoil have depressed Jordan’s GDP growth, impacting export-oriented sectors, construction and tourism. Virtually every class of goods and services exported from Jordan saw a significant drop in export volume between 2008 and 2009. In 2013, Jordan depended heavily on foreign assistance to finance the budget deficit, as the influx of about 600,000 Syrian refugees put additional pressure on expenditures. The recent crisis in the region, where militants from the Islamic State of Iraq and Al Sham (ISIS) have been controlling large areas in Iraq and Syria, has curtailed their trade with neighboring countries such as Jordan. However, some positive signs of improvements in economic activity can be seen in 2014 on the back of the increase in public spending and private consumption, both of which were supported by the Gulf grants. Tourism activity is improving after years of slowdown, with increases of about 7 percent in the number of arrivals in the first quarter of 2014 compared to the previous quarter.

Jordan’s economy is dominated by services, which account for over 70 percent of GDP and more than 75 percent of jobs. Agriculture provides earnings for about 20 percent of the population and employs about 7 percent. Although the sector is small in relation to the overall economy, agriculture contributes an estimated 28 percent of GDP. The economic resource base also centres on phosphates, potash, and their fertiliser derivatives; tourism; overseas remittances; and foreign aid. Lacking coal reserves, hydroelectric power, large tracts of forest or commercially viable oil deposits, Jordan relies on natural gas for 10 percent of its domestic energy needs. Services accounted for more than 70 percent of GDP, and employed nearly 75 percent of the labour force.
The 2010 Human Development Index classified the country as “high human development” (seventh among Arab countries, after the Persian Gulf states and Lebanon). The 2010 Quality of Life Index prepared by International Living magazine ranked Jordan second in the MENA region after Israel. Only 1.6 percent of Jordanians make less than USD 2 a day, one of the lowest proportions in the developing world according to the Human Poverty Index.

However, despite Jordan’s upper-middle-income status, 14.4 percent of Jordanians were living below the official poverty line in 2010. There is chronically high unemployment, particularly affecting young people and women.

While Jordan has weathered the economic and political impacts resulting from the Arab Spring, and economic growth is expected to increase in the medium term, the influx of Syrian refugees has overstretched public services and may have a long-term effect. As of the end of September 2013, officially registered Syrian refugees in Jordan amounted to about 8 percent of Jordan’s population. The inflow of refugees has presented Jordan with additional fiscal pressure (estimated by the Jordanian authorities at 1 percent of GDP for 2012 for the public sector, including utility companies), mostly for education and health care needs, as well as increased security outlays.

**Lebanon**

Constitutionally, Lebanon is a parliamentary republic, with the president as the head of state and acouncil of ministers (cabinet). The president appoints the prime minister following consultations with Parliament. The legislative branch consists of a single-chamber parliament of 128 members. The current political situation is unstable, with a high risk of political and religious violence. Lebanon’s governing coalition, backed by the Shiite militia Hezbollah, has close links to the Syrian regime, while the opposition is sympathetic to Syrian rebels who have established a rear base in northern Lebanon. Clashes have erupted between rival Lebanese groups in the north.

The Lebanese economy is service oriented (services account for more than 60 percent of GDP), and the main growth sectors include banking and tourism. Industrial sectors account for a small share of the economy, and Lebanon relies primarily on imports for consumption. The share of agriculture was in constant decline from 1997 to 2011, reaching 4 percent of GDP in 2011. With a heavy reliance on imports of goods, Lebanon has a structural trade deficit of around 38 percent of GDP (2013). The country nevertheless benefits from important financial inflows, mainly coming from the remittances of the Lebanese diaspora and tourism and investment inflows from the Gulf countries, partially offsetting a chronic trade deficit. Financial flows are also a main element of resources of banking deposits, allowing the banking sector to play a major role in lending to the government and supporting its ailing public finances. Lebanon has been incurring a chronic budget deficit that has fuelled public indebtedness. The public finance deficit reached more than 9 percent of GDP, and debt to GDP went up again to 140 percent in 2013.

The economy has also been hit hard by the Syrian crisis, and sectarian tensions have increased. One-third of Syrian refugees were located in Lebanon by the end of September.
2013, equivalent to about 19 percent of Lebanon’s population. Real GDP growth declined from 8 percent on average in 2009 and 2010, to 1.5 percent in 2012, partly as a result of a sharp decline in tourism and related industries. Although bilateral trade accounted for only 6 to 9 percent of Lebanon’s exports of goods and services before the conflict, transit trade and tourism from and to Lebanon through Syria were reportedly substantial and have been seriously affected by the conflict. Foreign direct investment inflows are estimated to have been about 7 percent of GDP in 2012, down from 12.7 percent, on average, during 2009 and 2010.

The number of people living below the poverty line has increased in the past decade. According to the Lebanon Millennium Development Goals report from 2008, the proportion of those living below the “upper” poverty line (estimated at USD 4 per capita per day) stands at 28.5 percent. Of these, 8 percent are extremely poor and live below the lower poverty line, estimated at USD 2.4 per capita per day, and are unable to meet their basic needs. Regional disparities are high.

**Libya**

Oil and gas production account for 65 percent of Libya’s GDP, 96 percent of exports, and 98 percent of government revenues. As such, developments in the oil sector directly affect the overall economy and show up almost immediately in the growth of real GDP. The ensuing civil war disrupted production facilities and pipelines, causing a dramatic fall in oil production from an average of 1.7 million barrels per day in 2010 to fewer than 0.5 million barrels per day in 2011. This resulted in the total collapse of the economy. Real GDP dropped by 62 percent, and because of the dependency of the rest of the economy on the oil sector, non-oil real GDP also declined by 52 percent. In the space of one year, nominal GDP was more than halved from USD 75 billion in 2010 to USD 35 billion. However, the economy bounced back in 2012 as oil production recovered much faster than had been expected, reaching a near pre-uprising level of 1.4 million barrels per day. Overall real GDP jumped by over 100 percent in 2012. Nominal GDP in the year reached USD 81 billion, some 8 percent above the 2010 level. This optimism was unfortunately dashed in early 2013 as militias and labour groups targeted oil facilities as a way to achieve their political and economic demands, and separatists in the eastern region declared their “independence”. As a result, oil production steadily declined from 1.4 million barrels per day at the beginning of 2013 to only 0.3 million barrels per day by the end of the year.

Currently, tensions between nationalists and Islamists have stymied attempts to produce a stable government, and in 2014 the country was riven by fighting between rival militias. Central government collapsed, and the United Nations has struggled to bring political factions together. Regional and tribal factions, as well as expanding militia activities, pose an increasing challenge to the authorities, as well as diverting attention away from constitutional and socioeconomic reforms. The country is hopelessly divided into two rival governments, backed by two military campaigns that have been in full swing since early 2014.

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16 Lebanon is considered as “the top host country by number of refugees per 1,000 inhabitants”, with 178 refugees per 1,000 inhabitants (data for 2013).
Morocco

Morocco is a constitutional monarchy. The Constitution provides for a monarchy with a parliament and an independent judiciary. The prime minister is the head of the government, and executive power is exercised by the government, although the king holds executive and legislative powers, including the power to dissolve the parliament and issue royal decrees called *dahir*s, which have the force of law. Legislative power is vested in the bicameral parliament.

Morocco’s economy is the fifth largest in Africa. It depends mainly on agriculture, phosphate mining, remittances from Moroccans living abroad, and tourism. The composition of the economy is weighted towards services, which, in 2011, produced 55.1 percent of GDP, while the share of industry was 29.9 percent and the share of agriculture 15.1 percent. This composition has stayed very stable throughout the past decade. The agricultural sector plays a significant role in the Moroccan economy, not in terms of contribution to the national GDP, but as the most important sectoral employer of the working population. As the agricultural sector depends on climate conditions, it is climate sensitive and subject to high year-to-year variations. The tourism sector is continuously growing. In particular, in rural areas, the development of the tourism sector is regarded as a strategy to tackle the still very severe poverty situation.

Morocco has been on a steady path of growth in the past decades. Growth averaged 4.8 percent over 2001–2012, despite an unfavourable environment marked by severe drought in 2007 and an overall economic slowdown in 2008, compared to 2.8 percent in the 1990s, as GDP per capita doubled from 2001 to reach USD 2,951 in 2012, unemployment declined from 13.6 percent in 2000 to 9 percent in 2012, and absolute poverty decreased from 15.3 percent to roughly 8.8 percent between 2001 and 2008. After significantly decelerating in 2012 due largely to regional uncertainties, the crisis in Europe, high world commodity prices and a poor harvest, overall growth accelerated to about 4.5 percent in 2013, driven by a strong rebound in agricultural production, and despite a slowdown in non-primary activity (IMF 2014). Inflation has remained low, averaging about 2 percent despite the increase in the prices of some subsidised energy products. The fiscal deficit declined from 7.3 percent of GDP in 2012 to 5.4 percent of GDP in 2013 (IMF 2014).

Despite a steadily improving economic situation, Morocco has been affected by the wave of protests that has swept the MENA region since 2011. Morocco had already engaged on a wide-ranging reform programme to strengthen the roles of the regions and promote social solidarity and inclusion. A new constitution was adopted through a popular referendum on July 1, 2011, and was promulgated. The new constitution provides mechanisms for the construction of a modern state of law and institutions. It also lays the foundation for extended regionalisation as a democratic and decentralised system of governance. However, a quarter of the population is still economically vulnerable (near poverty) with persistent disparities, as 70 percent of poverty is still rural, and most development indicators in rural areas lag behind urban areas. Moreover, rural poverty exacerbates gender disparity, with relatively higher illiteracy and primary school dropout rates for rural women, and higher infant and maternal mortality.
Syria

Prior to the crisis, Syria’s economy depended on the oil and agricultural sectors, themselves subject to fluctuating oil prices and rainfall. The main sources of foreign earnings were oil exports, exports of services, and foreign transfers of income and remittances.

The conflict, now in its fourth year, has led to more than 100,000 casualties to date. According to data from the United Nations High Commissioner for Refugees (UNHCR) as of March 2015 around half the Syrian population had been forced to leave their homes, with 7.6 million internally displaced, 3.8 million refugees, more than 1.5 million non-refugee migrants, and close to 7 million people in need of humanitarian assistance inside Syria. Additionally, more than 2 million Syrians are now refugees in neighbouring countries, resulting in severe repercussions for host countries, particularly Jordan and Lebanon. The Syrian economy has been devastated by the conflict. All sectors of the economy have contracted significantly, by about one-quarter to one-third, and the country’s physical and social infrastructure and capital stock have suffered significant destruction. According to World Bank data, unemployment is estimated to have increased from 15 percent to 58 percent between 2011 and 2014. Among the unemployed, about 3 million lost their jobs during the conflict, which has adversely affected their 12.2 million dependents. The conflict has pushed millions of people into poverty, with four out of five Syrians estimated to be living in poverty in 2014. Key social outcomes have also deteriorated as a result of the conflict. Lack of access to health care and scarcity of medicine have led to a catastrophic health situation. Poor food availability and quality and successive cuts in subsidies on bread have exacerbated nutritional deprivation.

Tunisia

Tunisia is a constitutional republic, ruled by a president elected by the Constituent Assembly and with executive power exercised by the government. The prime minister is appointed by the president.

The regime of former president, Zine el-Abidine Ben Ali, was ousted in January 2011. Tunisia’s political transition gained new momentum in early 2014, with the resolution of a political deadlock, the adoption of a new constitution and the appointment of a new government.

Tunisia has a diverse, market-oriented economy, with important agricultural, mining, tourism and manufacturing sectors. After a short-lived rebound in 2012, the increasing political and social instability, as well as the difficult external environment, which characterised most of 2013, have led to a slowdown in economic growth. According to World Bank data, rebounding from a contraction of 1.9 percent of GDP in 2011, the economy grew by 3.6 percent in 2012, somewhat above expectations. Unemployment continued to decline, reaching 15.3 percent at the end of 2013 compared to 16.7 percent one year earlier, but still well above the pre-revolution level of 13 percent. In 2013, the deficit reached 6 percent. The external current account deficit remained large for most of 2013 and is estimated to have hovered at similar levels as in 2012 (8.2 percent of GDP). The trade balance deficit widened from 10.3 percent of GDP in 2011 to 13.4 percent in 2012. Following a rebound in 2012, foreign direct investment declined in 2013, in the
context of persistent political uncertainty, and foreign exchange reserves gradually declined up to the end of 2013.

Wide socioeconomic disparities remain one of the main social challenges faced by Tunisia, despite the alleviation of poverty over the last decade. Poverty affected 15.5 percent of Tunisians in 2010 (4.6 percent in the case of extreme poverty), compared to 23.3 percent in 2005 and 32.4 percent in 2000. But this overall decline in poverty has had little effect on the centre-west and south-west of the country. Differences between regions are growing, even though inequalities have declined within these same regions. Global inequalities have decreased, with a decline in the Gini Index from 0.37 in 2000 to 0.35 in 2010. Despite the decrease in inequalities at the national level, regional disparities have continued to increase, further polarising society.

**Strategic and institutional framework**

**Algeria**

Algeria has traditionally based development planning on five-year cycles. The current five-year plan (2010–2014) strengthens the participatory, inter-sectoral approach to planning and implementing integrated natural resources management. It permits the sustainable use of biodiversity, the prevention of soil degradation, sustainable water management and greenhouse gas reduction. In the environmental sector, Algeria has a national environment strategy, a national plan for environmental action and sustainable development (*Plan national d’action environnementale et de développement durable*, adopted in 2002) and a national plan for renewable energy development (*Programme national de développement des énergies renouvelables*, PNDER, adopted in 2011). It also has a set of legislative instruments, which in 2013 covered natural resources management, the environment and territorial policy. More than a dozen laws have been passed over the last decade related to protecting the environment; promoting sustainable development; managing and disposing of waste; protecting coastlines, mountainous areas and deserts; managing water; promoting renewable energies; and shaping towns and cities. The National Spatial Development Scheme (SNAT, or *Schéma national d’aménagement du territoire*), established in 2010, sets out the long-term vision to 2025 that shapes and complements all these policies. It also provides a policy framework for a wide range of environmental protection and regional development efforts aimed at sustainable development. Within the SNAT 2025 framework, the government foresees more measures to improve waste disposal and to promote the water and sewage sectors (including probably the “environmentally incorrect” construction of dams). Around 40 sewage treatment plants have been slated for construction and 20 others for restoration, which will raise the treatment capacity to 600 million m$^3$ per year. The plan also includes the construction of 13 seawater desalination plants, of which two are already in service (in Arzew and Algiers). Algeria continued to implement the programme for renewable energies (PNDER) in 2013, working towards the goal of using solar energy (thermal and photovoltaic) to provide 37 percent of the country’s electricity needs by 2030.

with a time horizon of 10 years. The SNE-DD was last evaluated in 2003. However, there is no evidence of later evaluation or of the development of a renewed strategy after 2011.

Algeria developed the National Climate Plan (*Plan National Climat*) in 2013, aimed at coping with climate change risks. This strategic document, developed in partnership with the German Agency for International Cooperation (GIZ), reviews the major challenges facing Algeria in terms of the climate change mitigation and adaptation measures needed, particularly in hotspot sectors such as agriculture, water resources and health. The National Climate Plan also presents concrete operational actions, as well as actions relative to the institutional structure and implementation proposals.

A number of institutions and bodies have also been created, including the National Observatory for Environment and Sustainable Development, the Coastal Commission, the National Waste Management Agency, the National Centre for Cleaner Production Technologies, the Biological Resources Development Centre, the Environmental Sciences Academy (*Conservatoire des Formations aux Métiers de l’Environnement*), the School of Water Sciences (*Ecole des Métiers de l’Eau*), the National Urban Planning Agency, the Electricity and Gas Regulatory Commission, the National Hydrocarbon Regulatory Agency and the National Agency for the Promotion and Conservation of Energy.

A national IWRM agency was established in July 2011 to assist decentralisation to the five existing hydrographical basin agencies, to which are attached consultation committees bringing together representatives of local institutional actors and associations.

*Egypt*

The development objectives of the Government of Egypt were set out in Egypt’s long-term programme — the National Plan (1997–2017). This has been accompanied by a series of five-year plans. The sixth five-year plan (2007–2012) focused on sustainable development and on strengthening the national economy to enable it to face global competition and reduce poverty. The government’s general goals in this plan were to: (i) eradicate poverty and unemployment; (ii) realise higher rates of economic growth; (iii) achieve an efficient and competent economy (by building a knowledge-based economy, developing Egyptian exports and promoting the role of the private sector); and (iv) achieve a balance between development requirements and environmental preservation.

Due to political volatility after the Egyptian revolution, an intermediate short-term strategy of fewer years has been adopted and should be replaced by a new long-term strategy (possibly a new five-year plan). The short-term strategic development priorities of the Egyptian Government follow three main pillars:

- sustainable and inclusive growth — transition from economic growth to sustainable human development;
- socio-political rights; and
- environment and sustainable natural resources.

The third pillar gives special attention to the impact of economic growth and development on Egypt’s environment and related sectors, including water, sanitation, health and waste management. The importance of introducing environment-friendly practices such as eco-
tourism is highlighted. Moreover, the third pillar is concerned with the potential threats related to climate change, water scarcity and energy security.

In November 2012, the Ministry of Planning and International Cooperation published the Strategic Framework for Economic and Social Development until the year 2022 (Proposal for Community Dialogue) as a strategic framework for the National Development Plan. This (still draft) plan envisaged the development of a transitional plan for recovery from the economic and social impacts arising from the political and security troubles that occurred in 2011; a five-year plan with different alternatives to build the sound constituents for economic development; and a four-year plan aimed at taking the first steps towards achieving high sustainable growth rates (it targets a growth rate of 6 to 8 percent).

The National Environmental Action Plan (NEAP), published in 2001, represented Egypt’s agenda for environmental actions for 15 years (2002–2017). It complements, and is integrated with, sectoral plans for economic growth and social development. It is designed to be the framework that coordinates future environmental activities in support of sustainable development in Egypt. The NEAP was the basis for the development of sectoral environmental strategies for water resources, air, biodiversity, waste, land management, the marine environment and bio-safety. It was also the basis for the development of local environmental initiatives, actions and activities.

Egypt is among the first Arab countries to join the cooperative global efforts to confront climate change threats. It submitted two national communication reports (the first and second national reports) under the United Nations Framework Convention on Climate Change (UNFCCC) and developed the National Strategy for Adaptation to Climate Change and Disaster Risk Reduction in 2011.

The problem with planning in Egypt was lack of execution. Since the five-year plans were drafted within one section of the ministry, without building consensus among major stakeholders, including each of the ministries that were the real implementers, the national plan was simply a concept paper that did not call for execution. Accordingly, many plans, visions and strategies were well prepared but never implemented.

Jordan

The key strategic development directions of Jordan are defined in the National Agenda 2006–2015, which contains a set of priorities and action plans in the political, social and economic fields. The chief objective of the National Agenda is to “improve the quality of life of Jordanians through the creation of income-generating opportunities, the improvement of standards of living and the guarantee of social welfare”. It comprises three dimensions: government policies and reforms; basic rights and freedoms; and the services, infrastructure and economic sectors. To ensure real ownership of the reform process, the authorities have developed a parallel initiative under the slogan Kulluna al Urdun (“We Are All Jordan”), aimed at bringing together various representatives of

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17 This was the result of efforts made to reform the planning procedures in Egypt after 2011. The efforts were led by the Ministry of Planning and International Cooperation, with the support of a JICA expert. The newly established central planning organisation, the Planning Committee, was responsible for drafting the new development plan.
Jordanian society to discuss the future of the country. It is intended to consolidate support for the objectives of the National Agenda, while taking into account the previous reform initiatives. These reform plans were implemented based on a three-year executive programme aimed at translating the priorities into more concrete actions, their cost being taken into account in the budgetary perspectives.

The Poverty Reduction Strategy 2013–2020\(^\text{18}\) is an extension of the National Agenda. It presents a detailed roadmap to implement the poverty reduction components of the National Agenda. The overall goal of the Poverty Reduction Strategy is to “contain and reduce poverty, vulnerability and inequality in the current socioeconomic environment of Jordan, between 2013 and 2017, through the adoption of a holistic and results-oriented approach, which targets poor and below middle class households”, with the important specific objective to “alleviate the impacts of climate change and environmental degradation on the members of poor and vulnerable households”. The Jordanian Government also recently launched the Executive Development Plan 2013–2016, which responds to urgent needs and sets fiscal consolidation, higher growth and greater equity and inclusion as key objectives. The plan focuses on important reforms and policies to be undertaken in the coming period; and capital investment projects and programmes.

In addition to these strategic framework documents, the development planning system in Jordan comprises a number of sector-based strategies that serve as planning instruments for the implementation of the National Agenda, such as the National Employment Strategy (2011–2020), the Education Strategy, the Transport Strategy, and the Tourism Strategy.

Jordan’s environmental sector policy is based on an outdated national environmental strategy from 1992, and the National Environmental Action Plan of 1995. However, in 2007 the Ministry of Environment developed the Environmental Strategy Implementation Plan 2007–2010, which builds on the ministry’s strategic objectives and functional areas. It links and derives its programmes and activities from the National Agenda and the previously developed environmental strategies and efforts. For each of the seven strategic objectives of the Ministry of Environment, the Environmental Strategy Implementation Plan 2007–2010 spells out policies, programmes and activities, and performance indicators. Outcome-based targets are not set, however, and the performance indicators are more output than outcome based.

A water strategy has been formulated by the Ministry of Water and Irrigation and was adopted by the Council of Ministers in 1997. The strategy stresses the need for improved resource management, with a particular emphasis being placed on the sustainability of present and future use. In 2005, the National Water Master Plan was developed.

Finally, Jordan has recently developed the National Climate Change Policy and Sector Strategic Guidance Framework of the Hashemite Kingdom of Jordan 2013–2020. The objectives of the policy are to build the adaptive capacity of communities and institutions, with consideration for gender and addressing the needs of vulnerable groups; to increase the resilience of natural ecosystems and water, as well as agricultural resources, to

\(^{18}\) This is the second Poverty Reduction Strategy in Jordan. The first was adopted in 2002, under which several social programmes have been implemented to create more job opportunities, eliminate unemployment and provide cash and in-kind assistance to the poor and marginalised groups.
climate change; and to optimise mitigation opportunities. The national priorities and the pillars of the climate change policy are adaptation to climate change and the mitigation of greenhouse gas emissions, with an emphasis on adaptation as the imperative track.

**Lebanon**

To date, Lebanon has not yet drafted a comprehensive national development strategy. Nor does Lebanon have a national development plan or a poverty reduction strategy. Lebanon’s economic, social, political and environmental performance has been shaped by its recent political history, which is marked by a series of conflicts that have knocked the country off its developmental track. As a result, Lebanon’s governments have repeatedly been preoccupied with immediate damage caused by the war, or, more generally, with reform that relates to “states of emergency” as opposed to “normal” policymaking. As a result, entire sectors have suffered neglect (social development, human rights, gender, the environment, public institutions), to the advantage of narrow recovery strategies that target the economy and reconstruction.

However, over the last decade Lebanon has issued a number of national strategies, policies and assessments that can potentially pave the way to a sound development strategy, including:

- the Recovery, Reconstruction and Reform programme that was prepared by the Lebanese Government for the International Conference in Support of Lebanon, Paris III meeting, in 2007;
- the Social Action Plan: Towards Strengthening Social Safety Nets and Access to Basic Social Services, also prepared for Paris III, which was a welcome recognition of the importance of “social” objectives for sustainable development, although unfortunately the environment received little attention; and
- the United Nations Development Assistance Framework (UNDAF) Report (2010), which was built on the two above strategies, as well as the Common Country Assessment (CCA) of 2007 and the knowledge base of the UN Country Team, and which developed a set of objectives that covered some of the gaps in previous plans and highlighted areas for development in Lebanon.

More recently, two main strategies have been developed:

- a three-year programme (2010–2012), which was developed by the Ministry of Environment; and

**Morocco**

Following the 1992 UN Conference on Environment and Development in Rio de Janeiro, Morocco developed a set of strategies in order to better protect the environment.

In fact, Morocco’s early approach to sustainable development was mainly environmental and marked by two main strategic documents. The National Strategy for the Protection of
the Environment and Sustainable Development (Stratégie Nationale pour la Protection de l’Environnement et le Développement Durable, SNPEDD) was published in 1995. The SNPEDD’s main objective is the integration and strengthening of environmental concerns into economic development activities. Its main working areas are water, waste, air, soil, and the urban and coastal environment — all in relation to both sustainable management and pollution. The SNPEDD was followed by the National Environmental Action Plan (Plan d’action national pour l’environnement). The NEAP offered an overview of the environmental situation of the country and was structured around the following priorities: the protection and sustainable management of water resources, soil resources and nature; air protection and the promotion of renewable energy; the prevention of natural disasters and major technological risks; the improvement of the urban environment; and environmental management and communication. A very important part of the NEAP was a matrix containing actions, their foreseen costs, and the implementing government authorities. It called for the creation of a national implementation committee and regular follow-up to the work undertaken. Although this constituted an important step towards fostering environmental sustainability, many of the targets that arose from these strategies have still to be met.

Recently, Morocco has started to integrate sustainable development principles into its sectoral policies. In 2010, the Government of Morocco passed the National Charter for Environment and Sustainable Development (Charte nationale de l’environnement et du développement durable) as a declaration of the country’s intention to move onto a more sustainable path of development and growth by articulating the values and principles of environmental protection and sustainable development in all areas of socioeconomic development and by defining the rights, duties and responsibilities of individuals and economic agents. The charter, which was based on a wide participatory approach at community, regional and national levels, was intended to form the framework for national environmental laws and for future environmental policies. The aims of this strategic document are to:

- recognise environmental rights that should be protected and respected, focusing on the duties of the state, local authorities, public institutions and companies concerning sustainable development;
- strengthen the legal protection of resources and ecosystems by listing the types of actions or steps that the state proposes to take in order to fight against all forms of pollution;
- establish sustainable development as a core value shared by all segments of society and as a process followed by public policy development;
- create a coherent and efficient system to implement the contemplated measures;
- lay down the groundwork for a system of environmental responsibility with a mechanism of financial compensation for damage to the environment; and
- establish an environmental police that ensures respect for these rules.

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The charter action plan foresees the implementation of an integrated sustainable environmental protection system as an operative management tool with three main objectives in the short, medium and long term — respectively, the implementation of sectoral programmes to mitigate environmental degradation (2008–2015, e.g. the National Household Waste Programme); the implementation of the National Environmental Strategy (NES, 2011–2020), including the introduction of strategic environmental assessment (SEA); and the implementation of the National Sustainable Development Strategy (2011–2030) to jointly guide the country’s economic, social and environmental strategies towards sustainable development.

As a direct result of the adoption of the Charter in 2011, a draft law on the environment and sustainable development has been prepared by the Department of Environment. A second direct result is the preparation of a national environmental protection strategy and a strategy for sustainable development. At the time of the review, these strategies were only at an early stage of preparation.

Additionally, the Government of Morocco is striving to implement specific sectoral strategies by region, covering the vital areas of the country’s economic activity. At the beginning of the 2000s, Morocco developed a series of national sectoral strategies for tourism (Plan Azur), industry (National Industrial Emergence Pact, or Plan Emergence), trade (Plan Rawaj) and agriculture (Morocco’s Green Plan for Agricultural Development, or Plan Vert). These strategies, which aim at strengthening key sectors and diversifying the productive base of the economy, seek to create a new regional development process. The goal is to modernise the traditional sectors (agriculture, fisheries, mining etc.) and develop innovative sectors (renewable energies, logistics, automobile industry, aeronautics and high-value-added services). Other sectoral strategies were also developed, including the Logistics Strategy; the Fisheries Plan for maritime fishing; the Water Strategy; the 2015 Vision for Handicrafts; the Energy Strategy; and the Moroccan Digital Strategy for the development of information and communication technology.

These various strategies, with an overall projected EUR 64 billion budget, are spread over different timeframes.

Morocco’s Green Plan was one of its main priorities in 2013 as a means of establishing a resilient and sound economy that is a source of opportunity for vulnerable populations. This plan will lead to the adoption of sustainable agricultural practices and to the development of new sectors, such as eco-tourism and aquaculture, which could generate jobs and diversify sources of revenue in rural zones where 70 percent of poor Moroccans live.

The central government launched an important initiative in 2002, aimed at strengthening the role of local governments and supporting non-governmental organisations. The 2002 Municipal Development Plan (Plan Communal de Développement, PCD) focuses on improving local governance and the municipal administration, as well as on introducing and strengthening new forms of cooperation and partnerships. The plan includes an approach to promote “good governance”, such as equal access to public services, the participation of citizens, addressing exclusion, and promoting transparency and responsibility. The PCD makes special arrangements for cities with more than 500,000 inhabitants that are managed by a single commune, delineating arrondissements that are not legal entities.
Tunisia

Soon after the revolution, Tunisia stopped the preparation of the five-year development plans implemented since the 1960s. In the context of transition, the authorities have opted for a flexible strategy aimed at appeasing social and economic demands while preparing the necessary structural reforms. The current strategic framework includes (i) the government's guidelines, presented in March 2013; (ii) the September 2011 Jasmine Plan, and (iii) the May 2012 Development Strategy of the New Tunisia. These guidelines provide for a series of structural reforms and investments aimed at creating conditions for accelerated growth and job creation to ensure regional balance and inclusive development. They build on five pillars: (i) the implementation of a new generation of economic and social reforms; (ii) infrastructure modernisation; (iii) the consolidation of human and social development, including the strengthening of the social sectors of education and employment; (iv) global and balanced regional development; and (v) the promotion of sustainable development and the proper management of natural resources. These objectives are to be realised in two phases: a period of economic recovery in 2012 and 2013; and a period of stimulation with growth rates rising to above 7 percent in 2017.

Given the new challenges facing the country since the revolution, this plan appears somewhat ambitious and there is no detailed plan for its operationalisation.

In 1996, Tunisia adopted the Action Plan for Environment and Sustainable Development, or National Agenda 21, with a 10-year timeframe (1996–2006). Implementation was planned through economic and social development programmes, which translate the orientations of sectoral development policies. Local Agenda 21s constitute means to implement the National Agenda 21.

Tunisia passed the National Strategy for Adapting Agriculture and Ecosystems to Climate Change in 2007. The Tunisian National Climate Change Strategy and three sectoral adaptation strategies were elaborated in 2013 (awaiting political approval). However, Tunisia has become the third country in the world to anchor the importance of addressing climate change in its 2014 Constitution. Article 45 stipulates “the state guarantees the right to a healthy and balanced environment and the right to participate in the protection of the climate”.

Summary

The total surface area of the MENA region (21 countries) is 11.1 million km², accommodating a population of 381 million. This makes the region relatively scarcely populated, with a mere 34 inhabitants per km². The most important reason for the low population density is the arid conditions in the region (about 85 percent of the area is desert) and the scarcity of water resources: the proportion of arable land out of the total land area is only 4.9 percent.

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20The new economic and social five-year plan after the revolution in Tunisia, the Jasmine Plan, was announced by the Ministry of Finance in September 2011. The plan had three aspects: managing the crisis after the revolution; promoting the transition to democracy; and promoting sustainable social and economic development. For the first time in Tunisia, the plan was explicitly based on the concept of social justice, where almost half of the 10 targets were related to the democratisation process.
The MENA region is disproportionately endowed with natural resources, being the world’s richest region in terms of oil and gas reserves and one of the poorest in renewable water resources. Currently, MENA countries face major development challenges, from rapidly growing young populations, high unemployment rates and vulnerability to price shocks and climate change, to political and security challenges, including extremism and, most recently, violent conflicts in Libya and Syria.

The region experienced rapid economic growth between 2000 and 2010, then suffered a sharp economic slowdown post-2011, as a result of several economic and political factors. Prior to 2011, GDP per capita was growing steadily in the majority of the MENA countries, but the 2011 events in the region highlighted the limits of these forecasts, and MENA countries suffered a growth slowdown between 2011 and 2013. This growth slowdown has been accompanied by an increase in fiscal deficits. Large fuel (and food) subsidies have burdened governments’ public finances. Governments have tapped into their foreign reserves, reducing fiscal space. Unemployment levels have remained high, and particularly high among women. Most unemployed people are educated, but they need connections (wasta) to get jobs because of widespread corruption in the public sector, and because of a weak private sector that is not sufficiently dynamic to generate jobs due to the constraints in the investment climate that hinder private sector growth. Most of the labour force is engaged in the informal sector, and their jobs provide no security. These are people who most likely live near the poverty line (Devarajan et al., 2014).

After the profound social and political changes in 2011, the region is still fragile and suffers from (mainly youth) unemployment, poverty and regional disparities. Despite a wealth of oil resources and major improvements in health and education over the past few decades, this region’s political, social and economic systems have not evolved in a way that effectively meets the changing needs of its rapidly growing young population. Nearly one in five people living in the MENA region is between the ages of 15 and 24 — the age group defined as “young people”. The transition from a period of high to low fertility, starting from the 1980s, has altered the age structure of the population, creating a “youth bulge” of 96 million people between the ages of 20 and 29 in 2010, and an estimated 104 million in 2030. As a result, the current huge increase in MENA’s working-age population has created a new policy challenge for MENA governments, which rarely have enough resources to accommodate the volume of people entering the labour market.

The recent events in the Arab world have added new challenges to the fragile peace and security situation in the region. The models of development that have been adopted so far in some Arab countries have failed to realise people’s ambitions in the contexts of abundant socioeconomic potential. The Arab Spring represents a powerful reminder of the structural regional challenges of lack of political and economic freedom, accountability, governance reforms and job creation, and the need to enhance social and economic equality in the MENA region. Economic activity is faltering in several MENA countries because of decreases in tourism and investment levels, political and economic uncertainty, increasing commodity prices and more stringent conditions for access to finance, among other things. Domestic and foreign investments are declining because of uncertainty. Investment deals are being cancelled, postponed or relocated to perceived safer destinations. The financial sector is being disrupted, given its high sensitivity to instability. The economy is exposed to rising inflation, high youth unemployment and
unrealistic expectations as to the speed and directions of the transition process. Increasing prices and lowered economic activity would have a particularly acute effect on the poor.

The MENA region also faces growing challenges from environmental stresses, resulting from population pressures, urban growth, water scarcity and pollution, desertification and climate change, exacerbating water shortages. All MENA countries share environmental challenges in the following areas, which differ only in terms of magnitude and severity between the countries:

- water scarcity and quality;
- land degradation and desertification;
- urban and industrial pollution;
- inadequate capacities for waste management;
- coastal and marine environmental degradation;
- air pollution;
- climate change; and
- weak environmental institutions and legal frameworks.

Although the development planning framework differs significantly in the analysed countries, it can be concluded that there are significant improvements in this area. Some countries demonstrate full government support for an effective sustainable development culture through the introduction of comprehensive sustainable development strategies (Morocco, Tunisia, Jordan) or by the incorporation of environmental and sustainable development principles into the national development agenda (Algeria). However, the implementation of those principles still remains the weakest point.

Given the above, all the analysed countries can be classified into three categories of suitability for WATER SUM project intervention, according to their current political and economic circumstances:

- countries in which it is not possible to implement project activities due to war operations and serious security threats (Syria and Libya);
- countries with fragile economic and, more importantly, political situations, exposed to certain security risks due to regional conflicts and internal tensions, in which it is possible to implement project activities, although difficulties caused by internal political and structural constraints can be expected (Algeria, Egypt and Lebanon); and
- countries in which the implementation of project activities should not encounter major problems due to political and economic constraints (Morocco, Tunisia and Jordan).
Chapter III  Local self-government in beneficiary countries

Political context

Local governments in the MENA region face a wide range of challenges. In many countries, rapid urbanisation has led to a housing shortage, housing insecurity, and the growth of informal settlements. Moreover, infrastructure is often poor and overstretched. These immense challenges are, and will continue to be, exacerbated by the impacts of climate change. Both phenomena—rapid urban growth and the mid- to long-term effects of climate change—require local governments that provide jobs, social infrastructure, housing and basic needs efficiently, while simultaneously moving towards sustainable urban management.

Since the 1980s, decentralisation laws have combined varying degrees of political and administrative autonomy with central control over finances. The mismatch between functional devolution and fiscal centralisation constrains local governments. Central transfers continue to be the main source of local finance, and the share of local expenditure in GDP is still low, rarely exceeding 30 percent.

Territorial organisation and administrative structure

The MENA countries share common features in terms of the structure of local governance that reflect the legacy of the Ottoman and French colonial administrations.

Decentralisation reforms in the MENA region should be seen in the context of rapid urbanisation. The region has seen an average annual urban growth rate of 4 percent in the past two decades. The urban share of the total population grew from 48 percent in 1980 to close to 60 percent in 2000, and was expected to exceed 70 percent by 2015 (compared to an average of 54 percent for all developing countries). The “urbanisation of poverty” that has accompanied the region’s rapid urbanisation is adding enormous pressure on cities to deliver infrastructure, services, housing and jobs to meet the growing demands and needs of the urban poor (Bergh 2010).

Countries in the MENA region are typically divided into provinces or governorates, headed by a governor who is appointed by the minister of the interior or the minister of municipal affairs (or directly by the head of state — that is, the king in the monarchies of Jordan and Morocco, or the president). This is, in practice, the predominant level of regional governance. The presence of deconcentrated offices of central ministries that provide important public services reinforce their dominance. The provincial- or regional-level institutions are often hybrid structures — that is, they are at the same time both decentralised local authorities (with elected assemblies) and deconcentrated administrative units of the ministry of the interior (Bergh 2010).

Provinces/governorates are further divided into districts, and sometimes sub-districts headed by appointed officials. Some of the analysed countries have types of elected
bodies (mayors and/or councils) that are legally vested with powers commensurate with their status as legal representatives of the people, including the approval of plans, development projects, regulatory controls and local budgets. In practice, elected bodies and mayors wield greater authority.

Table 3. Territorial organisation and administrative structure in the MENA countries covered by the study

<table>
<thead>
<tr>
<th>Country</th>
<th>Provinces (wilayat)</th>
<th>Districts or constituencies (dawair)</th>
<th>Municipalities (communes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>48 provinces (wilayat)</td>
<td>160 districts (muhafazat)</td>
<td>1,541 municipalities (dawair)</td>
</tr>
<tr>
<td>Egypt</td>
<td>27 governorates (muhafazat)</td>
<td>232 regions (marakiz)</td>
<td>urban districts (dawair)</td>
</tr>
<tr>
<td>Jordan</td>
<td>12 governorates (muhafazat)</td>
<td>56 districts and sub-districts and 52 nawahi</td>
<td>93 municipalities</td>
</tr>
<tr>
<td>Lebanon</td>
<td>8 governorates (muhafazat)</td>
<td>25 districts (adqiyah)</td>
<td>1,181 municipalities</td>
</tr>
<tr>
<td>Libya</td>
<td>economic regions</td>
<td>provinces</td>
<td>Local governments (mahallat)</td>
</tr>
<tr>
<td>Morocco</td>
<td>16 regions (wilayat)</td>
<td>45 provinces and 26 prefectures</td>
<td>districts (circles); municipalities; urban municipalities; rural municipalities; 1,547 in total</td>
</tr>
<tr>
<td>Syria</td>
<td>14 departments or governorates (muhafazat)</td>
<td>60 districts (manatiq)</td>
<td>subdistricts (nawahi)</td>
</tr>
<tr>
<td>Tunisia</td>
<td>24 governorates (wilayat)</td>
<td>264 municipalities</td>
<td>delegations (mutamadiyat); districts (shaykhhat); sectors (imadat)</td>
</tr>
</tbody>
</table>

**Algeria**

The Constitution of Algeria does not contain any specific chapter on local government. It does not specifically state the principle of local authorities’ administrative freedom. Article 15 stipulates that the “territorial collectivities of the State are the ‘commune’ and the ‘wilaya’. The ‘commune’ is the basic collectivity.”

Since the territorial reorganisation in 1984, the administrative system in Algeria has been based on the following administrative units:

- **Provinces (wilayat)** (48 in total);
- **districts** or constituencies (dawair) (160 in total); and
- **municipalities** (communes) (1,541 in total).

All of them are governed by the same municipal statute. The commune is the country’s smallest organic administrative division. Its elected assembly constitutes the foundation of decentralisation. It represents the state’s basic governing authority, immediately above which lies the wilaya, the intermediary between the commune and the state. The wilaya (province) is the main unit of territorial administration and is simultaneously a deconcentrated administrative unit and a local government endowed with a people’s assembly.
The regional structure, with the region as a local authority granted legal status, does not exist. However, the regional constituency covering an area comprising several wilayas is tangible, to the extent that several state services, as well as their public and private businesses, have been established regionally — a trend that is increasing thanks to the economic liberalism adopted.

Municipalities and communes are run by councils and elected executive bodies.

**Egypt**

Egypt’s administrative divisions were established by the 1971 Constitution. There were originally three levels: governorates, cities and villages. Law No. 52 of 1975 later added two further levels to local municipalities: rural districts and districts. These divisions were incorporated into Act 43 of 1979 and remain in force. According to Law No. 43, local communities are enrolled in a five-tier system of local administration:

- **Governorates** (*muhafazat*) (27 in total). These are either fully urban (the four governorates of Cairo, Suez, Alexandria and Port Said), or combined from urban and rural communities. Governorates may comprise just one city, as in the case of Cairo or Alexandria. These single-city governorates are divided into districts (urban neighbourhoods).
• **Regions** (*markaz*) (232 in total). The *markaz* includes the capital city of the *markaz*, other cities (if they exist), and groups of villages. It functions as the centre vis-à-vis the constituent villages. Before 1975, the *markaz* was essentially an area division for the proper functional management of state activities (e.g. for security purposes and registration for military service). Now, each of the 232 *markaz* has an autonomous legal status as a local unit, supervising the lower-level villages.

![Figure 4. Governorates of Egypt](image)

• **Cities** (218 in total). Cities exist in all governorates: as a single-city governorate, as the capital of a governorate, as the capital of a *markaz*, or as a constituent city in a *markaz*. Moreover, a city may be recognised as having special status enacted by a special law, as, for example, the city of Luxor. Cities are divided into districts if functionally necessary.

• **Urban district.** This is the smallest local unit in urban communities. Urban districts differ from one governorate to another in terms of size, population and political and economic circumstances. Districts in Cairo and Alexandria are among the higher-ranking districts in Egypt — that is, the two are the political and economic capitals respectively. In addition, urban districts were once further divided into sub-district neighbourhoods known as *shaykhat*, which served as a smaller area division for efficient service delivery — for example, vaccination campaigns, public facilities etc.

• **Village.** The village is the smallest local unit in a rural community. Villages differ from one another in terms of the legal status. There are approximately 4,358 villages, of which only 920 are village local units. The remaining villages are
satellite villages. Any village that is not integrated into a “village local unit” should be included in the jurisdiction of the closer *markaz*. Moreover, these satellite villages are further divided into sub-village neighbourhoods, known as *hessa* (portions): *kafr*, and *ezba*. They are mainly responsible for ensuring security and resolving social and land conflicts or irrigation matters. Village chiefs are appointed by the respective governors.

![Central Government Structure](image)

**Figure 5.** Structure of the local government system in Egypt

Article 175 of the 2014 Constitution states “the State shall be divided into administrative units that enjoy legal personality. Such units shall include governorates, towns and villages. Other administrative units that have legal personality may be established, if public interest so requires.”

All five levels are legally designated municipalities, having locally elected popular councils and centrally appointed executive councils. The system is unique in that it creates five levels, each of which includes two “legally” independent bodies, but that together represent the executive authority.

The elected council has little or no authority, however, and an appointed executive council cannot be considered a representative body.

In Egypt, there are no specific laws on participation and no local spaces for consultation and participation.
Jordan

Constitutionally, Jordan is a unitary state with four tiers of administration: the central government, governorates (muhabzat), districts and sub-districts (alwiya, adqiyahand nawahi), and municipalities. Governorates, districts, sub-districts and nawahi represent the levels of deconcentration, whereas municipalities are the only autonomous body as defined by law.

Figure 6. Governorates in Jordan

- **Governorates** (12 in total) are deconcentrated administrative divisions of the central government, headed by a governor appointed by the king. The governorates act as agents “on behalf of” their respective central authority as the principal. Moreover, the line ministries work through regional agents (directors) who are assigned to the governorates.

- **Districts and sub-districts** (alwiya, adqiyahand nawahi) are subdivisions of regional authorities and also act as deconcentrated administrative units of the central government. There are 56 districts and sub-districts and 52 nawahi in total.

- **Municipalities** (93 in total) are not part of the central government and are not seen as local public entities with broader local responsibilities. They are governed by an elected mayor and executive council (except for the capital city, Amman, where the mayor is appointed directly by the king) and are supervised by the Ministry of Municipal Affairs. Municipalities vary greatly in size, from populations of fewer than 5,000, to greater than 100,000, and they also vary greatly in capacity.
Lebanon

Constitutionally, Lebanon is a unitary state with four tiers of administration: central, administrative regions (Mohafazat, singular mohafazah), administrative districts (aqdiyah, singular qadaa), and municipalities. Mohafazat and aqdiyah represent the levels of deconcentration in Lebanon, while municipalities are the only autonomous bodies as defined by Law.

- **Administrative regions/governorates (mohafazat)** (eight in total) do not enjoy any legal personality or independent authority. This is an administrative subdivision formed by the central government and headed by a governor appointed by the Council of Ministers on the recommendation of the minister of the interior. The duties of the governor of the mohafazah (the mohafez) are primarily administrative and involve the local implementation of policies established by the central government and coordination among central government offices and officials within the mohafazah. The mohafez represents all the ministries except for the Ministry of Justice and the Ministry of Defence. There are six administrative regions, or mohafazat: Beirut, Mount Lebanon, North Lebanon, Bekaa, South Lebanon and Nabatiyeh.

- Each mohafazah, with the exception of Beirut, is, in turn, divided into **districts (aqdiyah)**. Like the mohafazah, the qadaa is a geographical subdivision and enjoys neither legal personality nor financial autonomy. Of the 25 aqdiyah, five are administered directly by the mohafez, because they are capitals of their respective mohafazah. The remaining aqdiyah are administered by a district governor, the qaemakam, usually a grade two civil servant, who is appointed by the Council of Ministers on the recommendation of the minister of the interior. In total, there are 26 aqdiyah: one in Beirut, six in Mount Lebanon, seven in North Lebanon, four in Nabatiyeh, five in the Bekaa, and three in South Lebanon.

- **Municipalities** (1,181 in total\(^{21}\)) are established by a ministerial decision that establishes the name of the municipality, its location, and its geographical boundaries (according to Articles 2 to 5 of Law Decree 118/1977). The municipality is the only form of administrative decentralisation in Lebanon and is defined as “a local administration enjoying legal status and financial and administrative independence, which exercises powers and responsibilities over the area it is granted by law”. This law also states that the creation of what are known as “municipal unions” (currently 42 in total) — bodies that bring together a certain number of neighbouring municipalities with common interests — must be approved by the minister of the interior or the municipal councils in question.

\(^{21}\)The number of municipalities has grown steadily: in 1963, there were 475, and currently there are more than 1,000.
There is a high level of imbalance in the distribution of the population in Lebanon. Just 16 percent of the population are registered in half of the municipalities, while 10 percent of municipalities are home to 42 percent of the population.

Libya

State formation, decentralisation and modern local government in Libya, which became a state only in 1951, are of recent date compared to some countries in the region. However, the country has seen a number of different arrangements since then. All existing state institutions suffered heavily from Qaddafi’s arbitrary rule.

22 The three historical provinces (Tripolitania, Cyrenaica and the Fezzan) were broken into 10 governorates in 1963, after constitutional amendments and legal reform. After Qaddafi’s coup in 1969, some of the governorates were redesigned and renamed. In 1975, the governorates and their service directorates were
On July 31, 2012, the National Transitional Council passed the new Local Administration Law (Law No. 59). It apparently stipulates a four-tier government approach with a national level, a level of economic regions (Article 44), a level of provinces, and a local level. This model resembles an earlier system comprising planning regions, sub-regions, administrative districts and localities, known as mahallat.

The Local Administration Law of 2012 does not refer to the number of sub-units, but stipulates, in Article 4, that the establishment, geographical scope and name of those units must be regulated by law. There is thus an assumption that it is not the intention of the law to re-install the traditional three provinces.

Libya is approaching another critical stage in its transition: the preparation of a new constitution, laying the legal foundations of the new Libya. One of the most important questions facing any constitution-making process, and particularly Libya’s, will be how — and to what degree — governmental authority will be decentralised. Today, a major challenge for Libya is to build a legitimate, well-equipped local government to help reconstruct the country. The issue of decentralisation is now heavily politicised, as many

abolished by law, but continued to exist until 1983, when another reform introduced the baladiyat system of districts. It started with 46 districts, which were reduced in 1988 to 25 units. In 1995, Libya dropped the baladiyat system and reorganised into 13 districts (shabiyat). This number was altered in the reforms of 1998 to 26; in 2001 to 32 (plus three administrative regions); and in 2007 to 22 units.
actors, especially in the east of Libya, claim regional autonomy. “Federalists” and “anti-federalists” are at loggerheads about the future shape of the state. The former demand significant powers for the regions, alleging that anything else would continue the marginalisation of the east under Gaddafi; while the latter consider federalism to be a byword for the country’s disintegration.

**Morocco**

Article 135 of the Constitution of 2011 stipulates that the local government divisions in the Kingdom of Morocco are regions, prefectures, provinces and municipalities. They are legal entities under public law and manage their affairs democratically.

At the institutional level, contemporary Morocco has a three-tier decentralised government structure:

- The regional level comprises regions (16 in total), each one headed by a wali (regional governor), who is appointed by the king, and a regional representative council. Regions have the status of local governments. In the new Constitution the regional representative councils must be elected by direct universal suffrage, which was not the case under the 1996 Constitution.
- At the second level are **provinces** (45 in total) and **prefectures** (26 in total). The distinction between prefectures and provinces stems from the wish to treat urban areas differently, as they pose specific problems that are quite distinct from those of the rural zones, which are managed by the provinces.

- The third level consists of **districts (cercles)**, **municipalities (communes)** or **urban municipalities (communes urbaines)**, and **arrondissements** in some metropolitan areas. The districts are subdivided into rural municipalities (**communes rurales**). The total number of third-level entities is 1,547.

There is no hierarchical relationship between the three territorial levels. No local authority exercises authority over another. All local authorities are equipped with an elected body (council, prefectoral or provincial assembly, regional council) and subject to the supervision of an officer who represents the state authority and executive power (the **caïd** for rural communes, the **pasha** for urban communes, the governor for provinces or prefectures, and the **wali** for regions). Enforcement officers both represent the executive power of the territorial collectivities, and have powers delegated by various ministries, including the Ministry of the Interior, as part of the devolution of power.

**Syria**

The pre-revolutionary system of local governance in Syria was based on Law No. 15 of 1971 and encompassed a broad range of powers delegated to a variety of local authorities — in particular, the governorate. Syria’s administrative divisions included:

- **Departments or governorates (muhafazat)** (14 in total). The governorate was headed by a governor, appointed by the Ministry of the Interior, subject to cabinet approval. The governor was responsible for administration, health, social services, education, tourism, public works, transportation, domestic trade, agriculture, industry, civil defence, and the maintenance of law and order in the governorate. The governor was assisted by a provincial council, three-quarters of whose members were popularly elected for four-year terms, the remainder being appointed by the interior minister and the governor. In addition, each council had an executive arm of six to ten centrally appointed officers, selected from among the council's elected members.

- The **governorates** were divided into sixty **districts (manatiq, singular mintaqah)**.

- Districts were further divided into **sub-districts (nawahi, singular nahia)**. Districts and sub-districts were administered by officials appointed by the governor, subject to the approval of the Ministry of the Interior. These officials worked on local matters with elected district councils and served as intermediaries between

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23 Due to the duality within the Moroccan governance system, two different authorities function next to each other at the local government level. Representatives of the central government body are appointed by the king and are referred to as *asdeconcentrees*; they include officials affiliated to the Ministry of the Interior but also to line departments dealing with issues such as health and education. The officials appointed by the king include the **caïd** and **pacha** at the local level, and the governor and **wali** at the provincial level. Local governance bodies can be controlled through the Ministry of the Interior. The elected authorities at the local level are referred to as *decentralised* and consist of a city council headed by a president. The role of the president can be more or less compared to that of a mayor.
the central government and traditional local leaders, such as village chiefs, clan leaders, and councils of elders.

- Sub-districts contained municipalities — towns and villages (in total 107 towns, 248 small towns and 207 villages) — which are the smallest administrative units. Municipalities have a structure parallel to that of the governorate. Each has a publicly elected city council, which elects two-thirds of an executive bureau, the remaining one-third being appointed by the government.

Figure 10. Governorates of Syria

Tunisia

At the constitutional level, local governments in Tunisia were officially created by Article 71 of the Constitution, which stipulates “Municipal councils, regional councils and the structures to which the law gives the quality of local authority, manage local affairs according to the terms set by law.” The Constitution defines local authorities as “governorates and wilayat at the regional level, and municipalities at the lowest level”. On the legislative level, the municipalities are governed by Law No. 75–33 of May 14, 1975, supplemented and amended four times. Tunisia has a two-tiered decentralisation structure:

- **Governorates (wilayat)** (24 in total). The governors, appointed by the president of the republic following the recommendation of the Ministry of Interior, are representatives of the central government within the governorates, and the heads of the regional councils. In fact, a governorate is a legal hybrid structure that is both a deconcentrated administrative structure and a local authority. Each governorate is subdivided into various deconcentrated structures: delegations (mutamadiyat), districts (shaykhat) and sectors (imadat). Delegations (264 in total) are headed by delegates, who are state representatives in a delegation,

\[\text{As an extension of the Arab Spring, the National Constituent Assembly (NCA) is reflecting on new legislation covering decentralisation in Tunisia.}\]
appointed by the minister of the interior and supervised by the governor. The delegation operates the local administration.

- **Municipalities**, also referred to as urban municipalities (264\(^{25}\) in total). Municipal councils are elected by direct universal suffrage for five-year terms of office. Mayors are elected from within the municipal council, except for the mayor of Tunis, who is appointed by decree from among the council members.

![Figure 11. Administrative regions (wilayat) in Tunisia](image)

As part of their role as decentralised authorities, governorates can only intervene in certain areas and zones that are not part of municipalities and that are governed by the 165 rural councils that exercise their rights through regional councils (representation, budget) (UCLG 2006b).

Before 2011, governorates had two legal entities: the governor, who is the main regional administration contact and holds the governorate’s deconcentrated powers; and the regional development council, which is the local decentralised authority. The regional development council was suspended in the current transition phase after the revolution

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\(^{25}\)The organisation of the country into municipalities has continued to expand the number of municipalities; this movement has clearly accelerated in recent years: the number of municipalities rose from 69 in 1956 to 134 in 1966 and to 264 in 2012.
in 2011. Similarly, previous local development councils within delegations (composed of presidents of municipalities or municipal districts in delegations, presidents of rural councils, heads of sectors (imadat), representatives of technical services at local level; and those in charge of economic, social and cultural issues related to the delegation) were suspended. The municipality, which is the oldest of the decentralised authorities, is managed by a municipal council, which is elected. The largest municipalities can be divided into urban subdivisions (UCLG 2006b).

The average size of Tunisian municipalities is relatively small (26,500 inhabitants). Besides the city of Tunis, with 750,000 inhabitants, about half of municipalities are of medium size (138 municipalities, with a population between 10,000 and 130,000). The remaining 125 municipalities are small (fewer than 10,000 inhabitants). The smallest municipality has fewer than 1,000 inhabitants.

Local responsibilities and power, level of decentralisation and the position of local self government

Algeria

The key figure in Algeria’s territorial administration is undeniably the local governor or wali, who plays a functional dual role, acting as state representative as well as executive of the wilaya people’s assembly. As state representative, the governor executes government decisions; directs, coordinates and oversees the activity of state services on a local level; and, on behalf of the executive of the wilaya people’s assembly, implements the resolutions taken. According to the provisions of the wilaya code, the governor also represents the wilaya “in all acts of civil and administrative life…” (Article 86).

The responsibilities of the local government in Algeria include:

- Responsibilities of wilayat (Wilaya People’s Assembly, or APW) cover:
  - Land-use planning — defines the land-use plan control of the province and its application. As such, it contributes to procedures involved in the implementation of land operations.
  - Water and agriculture — initiates and implements all measures for the protection, promotion and expansion of agricultural land, and the development of rural infrastructure. It develops preventive measures against disasters and natural calamities.
  - Education and vocational training — ensures the realisation of secondary education, technical and vocational training in the framework of national standards, and the administration of the school board and training standards. It also provides for the maintenance of these facilities.
  - Economy — infrastructure and road maintenance; business infrastructure and business promotion; rural development, including electrification.
  - Social issues — initiates, promotes or participates in programmes to promote employment in consultation with local authorities and economic operators, particularly for young people; has responsibilities over health
facilities that exceed the capacities of the municipality; child protection, elderly protection; culture and sport (in consultation with municipalities).

- Responsibilities of municipalities cover:
  - Planning and local development — In relation to the responsibilities assigned to it by law, and consistent with the wilaya plan and objectives of the land-use plans, a municipality develops and approves its development plan for the short, medium and long term. It participates in the procedures for the implementation of land operations. As such, it gives its opinions and makes decisions under the provisions of the laws and regulations. The municipality initiates any action that fosters and promotes the development of economic activities in relation to its potential and its development plan measures. It implements all measures likely to encourage and promote the involvement of operators. The municipality initiates any action that would provide assistance and support for disadvantaged social groups, particularly in the areas of health, employment and housing.
  - Urban planning, infrastructure and equipment — The preservation and protection of sites and monuments due to their vocation and their historical and aesthetic value; the preservation of aesthetic and architectural character, and the adoption of uniform types of habitat agglomerations.
  - Preschool and elementary education (assistance to central authorities).
  - Social services (assistance to central authorities).
  - Communal hygiene and the maintenance of green spaces.
  - Tourism.

Given limited political and economic autonomy, Algerian municipalities manage and implement central government programmes rather than their own, and are subject to the control of the territorially competent wali. Two state funds, the Solidarity Fund and the Guarantee Fund, are intended to fill any gaps in communal revenues. Since 1970, communes have adopted a Communal Development Plan, which is the project document for local development, conceived as a tool for planning integrated activities that include environmental and territorial management, economic growth, and solutions to social problems. Areas of intervention include: agriculture, water management, economic infrastructure, social infrastructure, administrative infrastructure, and means of implementation.

At the local level, administrative districts (dawair) are intermediate units between wilayat and municipalities, and are in charge of releasing permits or licences that municipal authorities do not release.

There is no legislation regarding citizen participation in managing local affairs. However, some municipalities have established frameworks within which to consult civil society.

Although the municipal code defines the profiles of key local administration staff, the municipalities do not have qualified executive staff. Furthermore, there is no national capacity-building strategy for local governments.
Egypt

Egypt’s local government system is largely a centralised hierarchy system with some deconcentrated features. According to the Constitution, the local units are (regional) organs of the executive government. Consequently, the local administration system in Egypt is more of a local administration rather than a local governance structure. Below the central government level, the country does not have elected regional or local governments. Instead, Egypt is divided for administrative purposes into 29 governorates. Governorates are led by governors, who are appointed by the president and who are, in practice, largely drawn from the Ministry of the Interior or the military. The central ministries (e.g. Ministry of Education, Ministry of Health Affairs) have directorates in each of the country’s 29 governorates. Although the governor is the administrative head of the governorate, and in that role has considerable administrative power, the governorate line directorates retain a technical relationship to their respective line ministries. Below the governorate level, there are two additional levels of local administration: the markaz or district level (or metropolitan cities in urban areas); and local administrative units, such as villages, towns and city neighbourhoods. Each level reports up to the next level, from which it receives its instructions and resources.

Although elected local popular councils are present at the different local levels, the hierarchy system within the elected and appointed local councils, in addition to the non-defined roles and responsibilities, represent the root cause of their ineffectiveness.

Each local administration unit in Egypt (governorate, region, city, district and village) has its own legal personality and each unit has a directly elected local community council. Fifty percent of them are from workers and peasants. Although local community councils currently merely serve as advisory bodies, without any executive responsibilities and without control over any financial resources, they are potentially legitimate subnational governance structures that could form the core of a local governance system in Egypt.

In addition to local community councils, there is an executive council, composed of specific positions at the local level, which works in parallel with the elected council. One such is the Governorate Executive Council headed by the governor, the members of which are deputies of the governor; heads of regions, cities, districts, government departments, agencies and general bodies in the range of the governorate specified by the Operational Regulations; and the governorate secretary general, who becomes the secretary of the council that convenes at least once a month by invitation of the governor, who specifies the place of the meeting.

According to the executive regulations, the local administration units take responsibility in 23 areas. The most important of these areas are educational affairs, health affairs, housing affairs, urban affairs and municipal utilities.

Local units fall under a complex control grid, both from outside and inside the administrative system. External control comes from the centre: governors are appointed by a presidential decree; the parliament issues local administration laws, and its members can attend and discuss any matter in local popular councils; the prime minister issues the executive regulations of local administration laws, approves governorates’ bank loans, and substitutes any local unit if its performance is considered unsatisfactory; the minister of local administration monitors the performance of local units and submits a yearly report to the parliament, resolves conflicts among local popular and executive councils,
and redistributes the money of the Joint Revenue Fund. Internal control is reflected in the administrative hierarchy of the local system: higher executive and popular levels control the activities of the lower ones (e.g. approving decisions, investigating officials, monitoring performance).

Jordan

Jordan still appears to be highly centralised, and local democracy and decentralisation still need a lot of improvement. The central government holds the lion’s share of local authority, including budgeting, strategic planning, education, health, security, and, most destructively, the power to dissolve any elected council at any time. Local planning and decision making are executed by deconcentrated central government through regional authorities (governorates). Line ministries work through regional agents (directors), who are assigned to the governorates. The regional authorities act as agents “on behalf of” their respective central authority as the principal. However, their freedom of action at the regional level is weak. On all important issues they have to coordinate with the central ministry. The governor is the coordinating administrative authority for all government departments and development projects in the governorate. However, governors do not have their own budget, because budget operations are fully centralised. The governor and staff are employees of the Ministry of the Interior and are also subject to central authority.

Every governorate has two councils that support the governor, who acts as chair of both:

- The Executive Council comprising the governor, representatives of line ministries in the governorate (local heads of sectoral line ministries — that is, directors) and local mayors. However, the Executive Council, despite its name, has no executive power within the current centralised governance structure. The council simply “coordinates” among line ministries at the regional level.

- The Consultative Council is made up of up to 25 appointed members who are selected from among honorary persons at the governorate level, including mayors and representatives of the civil sector, and in this capacity it reflects a participatory approach. However, the members of this council are not democratically elected and apparently have no accountability other than to the council and the appointing body.

In support of the governor’s planning competency, each governorate has a so-called local development unit (LDU). This is supposed to act as a secretariat of the governor to study, examine, and evaluate central socioeconomic policies that are relevant for the region as well as to develop proposals for coordinated policies. Although these LDUs are formally working for the governor, they are conjointly subject to central control under a governor.

Although Jordan’s Constitution provides detailed guidelines on the powers assigned to the government and its various agents at the national and governorate levels, it gives little indication as to how power should be divided between the various local entities — namely, the municipalities.

The existing Law on Municipalities (qanun al-baladiyat) was enacted in 2007 (Law No. 14), reversing the 2001 law in which all mayors and half of the council members in a municipality were to be appointed. In 2002, the total number of municipalities was
reduced from 323 to 99, thus giving greater influence to municipalities by merging smaller municipalities. The 2007 law reauthorised the election of council members and mayors (except in Amman). Currently, a law on local governance and a new municipal law have been drafted to “improve the representation and the authority of municipal and local councils” and to “enhance citizens’ participation in decision making”.

Figure 12. The governance structure in Jordan

Municipalities are classified into four categories:

- Category 1: Municipalities of governorate centres and any other municipality whose population exceeds 100,000.
- Category 2: Municipalities of district centres and municipalities whose population exceed 15,000, but do not exceed 100,000.
- Category 3: Municipalities of sub-district centres and municipalities whose population exceed 5,000, but do not exceed 15,000.
- Category 4: Other municipalities not covered by categories one, two and three.

According to the actual law, municipalities are considered local service providers, having a form similar to private association, and they do not form part of central government. As such, they possess some elements of self-rule through elected officials. They are not seen as local public entities with broader local responsibilities. However, they possess the right to levy and collect a limited range of local taxes and fees, which explains their “quasi-public” nature.

The responsibilities of municipalities in Jordan include: the planning of the city and its streets; building and construction measures; water, electricity and gas; the sewerage
Indeed, the Law on Municipalities imposes obligations and responsibilities on municipalities without giving them corresponding powers. Decision-making power on most policy and strategic planning issues is restricted to the governor and the line ministries. The law gives municipalities the right to certain fees, but does not empower them to collect those fees. The law also gives municipalities the right to spend their resources, but imposes many constraints on the way in which those resources are spent. Thus, the capacity of a municipality to implement plans is delimited by the constitutional powers guaranteed to the government. However, in exercising the rights to which they are entitled, many municipalities have developed techniques for overcoming legislative restrictions.

Overall, the administrative and financial capacity of Jordanian municipalities can be said to be low. It is important to note that municipalities play a relatively minor role in Jordan. Measured in terms of expenditures for the year 2010, they represented only roughly 3 percent of total public spending (excluding Greater Amman municipality). Moreover, municipal jurisdictions appear to cover only 3.6 percent of the whole territory, so there are significant territories under the direct control of the state (EuropeAid, 2011). Many municipalities lack resources, face debt and are overstaffed with little productivity. There is also a lack of cooperation among neighbouring municipalities, and municipalities also lack technical expertise and transparency. Municipalities have revenue-raising powers, but most have problems in collecting fees and taxes from individuals. In addition, there are no clear pieces of legislation that pinpoint exactly the roles of the municipalities and the roles of the central government via the governors. Confusion between laws and isolation are evident in the case of Jordan (UCLG, 2006a).

The impact of such domination by the central level is maximised by the fact the government is appointed by the king, rather than being elected or formed by the parliament. This results in local policies that are distant from local developmental needs and aspirations. However, a more decentralised approach was introduced by King Abdullah II in 2011 in order to crystallise a participatory approach that systemically bridges the gap between the central government and local constituents. Two constitutional amendments were created: the Constitutional Court and the Independent Election Commission (IEC). This was widely perceived to reflect true commitment to democratisation. A vigorous national debate over the future structure of local governance also ensued, resulting in two draft laws framing local democracy: the Law on Municipalities (which has been repeatedly amended to meet development needs); and the newly introduced Law on Governorate Councils.
The Ta’ef Agreement\textsuperscript{26} included a series of provisions responding to the need to restructure administrative divisions in Lebanon and enhance administrative decentralisation. In practice, according to the Ta’ef Agreement, the Lebanese model combines aspects of deconcentration at the level of the eight mohafazat (governorates) and 25 adqiyah (districts, singular qadaa) with administrative decentralisation at the municipality level. In the meantime, a number of administrative decentralisation proposals have been presented for discussion since 1995, including a 2014 draft law, but they all lacked a clear demarcation between the central government and its deconcentrated expressions on the one hand, and the elected decentralised authorities on the other. The only area where administrative decentralisation has been applied prior to 2014 was at the level of municipalities.

The importance of the 2014 Law on Decentralisation lies in its ability to strengthen decentralisation by transforming the districts (adqiyah) into key developmental actors. Instead of being headed by a qaimmaqam appointed by the central government, the qadaa will now have a council directly elected by the people. In addition, adqiyah will be endowed with a mandate to provide a wide range of services, as well as the fiscal resources to do so.

The qadaa will now be responsible for developing the region. This will include launching developmental projects in the sectors of infrastructure, transportation, environment and tourism, among others. Many of these functions have been reassigned from the central government because they are more compatible with the geographical area of the adqiyah, and because the latter can better realise economies of scale in the provision of services. This does not mean that the central government becomes irrelevant, but merely that it shares these functions with other tiers of government. The central government’s role is now focused on policymaking and regulation, while regional administrations take charge of service delivery.

However, Law Decree No. 118 of 1977 provides a broad delineation of the role of municipalities. It stipulates that any work having a public character or utility within the area of the municipality falls under the jurisdiction of the municipal council. In theory, this includes:

- street cleaning and garbage collection;
- public health and safety: establishing slaughterhouses; fire fighting and rescue services;
- town planning, including roads and public parks;
- infrastructure development, including sewerage systems, streets and roads, power and street lighting;
- services such as public transportation, infirmaries and hospitals, and other social services;

\textsuperscript{26}The Ta’ef Reconciliation Accord (“Ta’ef Agreement”), signed in 1989 after the 15 years of civil war in Lebanon, brought the armed conflict to an end and paved the way for a balanced and complex distribution of power amongst Lebanon’s various confessional communities.
• education, including establishing or helping public schools, and extra-curricular learning;
• environmental issues, such as developing and using the municipality’s natural resources; and
• establishing museums, theatres and markets, and providing low-cost housing.

In practice, however, the services provided by Lebanese municipalities are confined to marginal activities such as street cleaning, road asphalting, street lighting, setting up road signs, and rehabilitating and extending the sewerage and water drainage systems. There are also considerable differences between small and medium-sized municipalities on the one hand, and large municipalities on the other. There is therefore a wide gap between what the municipalities are allowed to do by law, and what they are actually able to do, given their resources. Most projects of a developmental nature are undertaken not by the municipality, but by the central government.

The 1977 law grants municipal councils decision-making powers and responsibilities relating to all activities of public interest within the municipal area, based on a non-exhaustive list that sets out the relevant areas of public interest. The law also allows municipal councils the right to supervise the work of public administrations belonging to the central authority that work within the municipal area via reports sent to the relevant authorities, as well as to communicate requests and recommendations through the mayor. The mayor holds executive power and is elected for a six-year period.

Libya

During the revolution and the civil war, local councils (whether civilian or military) played a crucial role in coordinating forces at the local level and defending communities. Many of these councils continue to operate today, with a peculiar intertwining of the political and military dimensions.

Only some of the over 100 municipal councils are elected: elections were held for 17 of them during the fall of 2013, and a new wave of elections took place between April and May 2014, including in Benghazi and Tripoli. The remaining councils were either self-appointed by revolutionaries or elected outside of national legislation in 2012. Most of the existing municipalities lack the capacity to handle even basic services, not to mention carry out urban planning. Their budget should be assigned by the national government, but this is proceeding very slowly.

Despite this confusion, many Libyans see local councils as the only credible and legitimate state institution, therefore some experts advocate a policy of decentralisation of power. While decentralisation is particularly important in restarting public services and increasing popular participation in the transition, the existence of a strong central government is still key to guaranteeing the rule of law and equal rights.

Morocco

The preamble to the Moroccan Constitution of 2011 defines the kingdom as a “united state” — that is, a unitary state. “The territorial organisation of the kingdom is decentralised. It is based on an advanced regionalisation.” The constitution lays out the
framework for decentralisation and advanced regionalisation, but it relies on an organic law to secure the essentials (conditions for the democratic management of the business of regions, the number of councils, the rules of eligibility, the electoral system, conditions of implementation of the deliberations and decisions by the presidents, shared and transferred powers, financial arrangements and other territorial collectivities).

The responsibilities of local governments in Morocco include:

- **Responsibilities of regions:**
  - the preparation and adoption of Regional Economic and Social Development Plans (PRDES)\(^{27}\) and Regional Spatial Development Schemes (SRAT) in line with the objectives and guidelines set out in the respective National Economic and Social Development Plan (PNDES) and National Spatial Development Scheme (SNAT);
  - improved water resources management;
  - the promotion of private investments;
  - professional training and employment opportunities;
  - environmental protection;
  - transferrable responsibilities (the establishment and maintenance of hospitals, lycées, and university institutes; the training of personnel and cadres at the level of the collectivités locales; and regional infrastructure and public works).

- **Responsibilities of provinces/prefectures:**
  - the promotion of economic and social development, including the preparation of prefectural/provincial economic and social development plans in line with the PNDES; the promotion of investments in public works and development programmes; and forest conservation and exploitation;
  - the promotion of rural development;
  - programmes and investments (in cooperation with central, regional or municipal authorities); and
  - the construction and maintenance of provincial/prefectural roads; the establishment and maintenance of inter-communal transport services; contribution to urban restructuring programmes and housing programmes in urban and rural areas; the protection of the environment; and the promotion of socio-cultural activities.

- **Responsibilities of municipalities:**

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\(^{27}\)The preparation of the PRDES is the responsibility of the regional councils. In reality, the latter have often partnered in the preparation process with the cabinet of the wali and the Caisse de Dépôts et de Gestion (CDG), which supports the development and financing of projects with a strong territorial dimension. Once adopted by the regional council, the PRDES must be approved by the High Council for National Development and Planning (Conseil Supérieur de la Promotion National et du Plan).
- the obligatory preparation of participatory medium-term investment plans (*Plans Communal de Développement*) or service plans, for example for municipal solid waste management;
- the promotion of economic and social development, including the preparation of a Local (Municipal) Economic and Social Development Plan (PCDES) in line with the PNDES;
- the promotion of private investments in public works and development programmes;
- the provision of basic public services, including drinking water supply and distribution, electricity distribution, sanitation, waste collection and disposal, urban transportation, and the slaughtering and transportation of meat and fish;
- forest conservation and exploitation;
- urban development and spatial planning, including the enforcement of city master plans (*Schemas Directeurs d’Amenagement Urbain*, or SDAU) as well as any spatial and/or urban development plans, communal construction regulations, and implementation or participation in urban restructuring and housing programmes;
- health and environment;
- socio-cultural facilities and activities;
- the establishment and management of infrastructure of a commercial or industrial nature (such as markets, slaughterhouses and grain silos); and
- transferrable responsibilities (the establishment and maintenance of primary education schools and institutions, health centres, small and medium-sized waterworks and facilities, and vocational training centres; the training of personnel and elected representatives of the commune; and communal infrastructure and facilities).

There is no hierarchical relationship between the three territorial levels. No local authority exercises authority over another. All local authorities are equipped with an elected body (council, prefectural or provincial assemblies, regional council) and subject to the supervision of an officer who represents the state authority and executive power (the *caïd* for rural communes, the *pasha* for urban communes, the governor for provinces or prefectures and the *wali* for regions). Enforcement officers both represent the executive power of the territorial collectivities and have powers delegated by various ministries, including the Ministry of the Interior, as part of the devolution of power.

However, the prefectural and provincial level is tightly controlled by the state, and it would be misleading to talk about real decentralisation even if the prefectures and provinces had elected assemblies. Their powers are limited, and their budgetary autonomy is almost non-existent (compared with that of communal councils). A series of communal council decisions are subject to the *tutelle*. For urban communes, the
tutelle\textsuperscript{28} rests mainly with the Ministry of the Interior and the Ministry of Economy and Finance, while the tutelle over the decisions of rural communes rests with the governor and the Ministry of Economy and Finance. Despite these constraints, evidence suggests that the recent reunification of the management of municipalities with more than 500,000 inhabitants has strengthened the position of the municipalities concerned in their interactions with the sub-national governments and deconcentrated services by allowing for better coordination. These levels are rather extensions of the central administration and a means of territorial control of the population.

At the same time, the regional representative council plays a prominent role in the development and monitoring of regional development programmes and regional patterns of territories (Article 143, Paragraph 3 of the Constitution).

The most important powers of the local municipalities, especially the communes, are mainly related to economic and social matters. As noted, the communal council is empowered to define the plan for social and economic development in accordance with the guidelines and objectives set by the national plan. These powers must, however, be within the guidelines established by the national plan. Communes also have power in terms of finance, taxation and communal property. They can review and vote on the budget and administrative accounts; open accounts and trusts with new credits; set tax rates, royalty rates and various fees; borrow money and receive donations; and manage, conserve and maintain common property. Communes also have the right to take any action of cooperation, association or partnership that helps promote their development.

Sub-national governments in Morocco are increasingly resorting to partnerships with public and private entities to manage the delivery of public services that have been decentralised to them. Although the current legal framework allows sub-national governments to develop partnerships with public and private entities for the delivery of public services, they lack the technical capacity to efficiently manage these partnerships. Similarly, although the legal framework for inter-municipal cooperation is in place, the structures remain underdeveloped.

Central government representatives continue to play an important role in Morocco, despite recent constitutional changes. This is clearly a very limited decentralisation and an authoritarian implementation of regionalisation that has a long history\textsuperscript{29}. However, compared with other countries in the MENA region, political decentralisation has thus far led to the establishment of three sub-national government levels (regions, provinces/prefectures, and communes, which together constitute the collectivités locales). The last 10 years in particular, starting with a major overhaul of the Charte Communale in 2002, have seen no fewer than a dozen laws and many more decrees, each a small step away from centralisation. Most notably, the changes eliminated an array of ex-ante controls by the Ministry of the Interior and the Ministry of Finance. The process

\textsuperscript{28}Tutelle is administrative supervision.

\textsuperscript{29}Decentralisation in Morocco effectively began in 1976, when local governments were recognised as entities under public law with a legal status and financial autonomy. They were placed under the supervision of the Ministry of the Interior and administered by elected executive bodies and councils. Legal provisions put in place since the adoption of the first Municipal Charter have allowed for a clear delineation of powers between the central government and the local governments. In parallel, there have been successive modifications to the territorial map. For example, the number of provinces has risen from 14 in 1959 to 45 today.
for distributing the local governments’ 30 percent share of national value added tax (VAT) receipts has been made more transparent. Municipalities have also been required to systematically develop participatory medium-term investment plans (*Plans Communal de Développement*). The process has also enabled a closer involvement of civil society in the decision-making process at the sub-national level. Although a range of competencies have been transferred to the sub-national level, there generally remains a large degree of ambiguity with respect to the demarcation of central, regional, provincial/prefectural, and communal competencies. Key areas of centralisation remain in place either formally or informally, including a number of ex-ante controls by the central government. In particular, most key decisions of a local government (budgeting, borrowing, taxing, creating subsidiaries, naming a secretary general, making procurement decisions) remain subject to the approval of the Ministry of the Interior. Even when such approval is only supposed to entail a legality check, it is often perceived to constitute a judgment call on municipal managerial decisions. In addition, although by law the municipality is responsible for a wide array of public services, national operators still provide a large portion of these services with, in practice, little or no contractual oversight from local governments, who, in theory, have delegated service execution to these operators. In larger urban areas there is a public local multi-service utility (*régie*), which is often perceived as reporting more to Rabat than to local stakeholders.

**Syria**

Although the administrative division in Syria was never abandoned during the Syrian crisis, the overall system of local governance is not functioning. The current system of local governance is thus based on local councils. These ground-level opposition groups vary in terms of size and structure and operate with different capacities and in different localities throughout Syria. Local councils represent an alternative to the absent civilian government in areas under regime control or recently freed, since the councils are run by the people living of the area.

The Syrian revolution was initially led by local coordinating committees formed in many towns and cities. The committees organised protests and documented human rights violations by the regime. By the beginning of 2014, most of Syria was embroiled in the conflict. New and disturbing aspects of the revolution emerged when battles broke out during 2013 between the “Free Syrian Army” and armed Islamist groups sponsored by non-Syrian actors who had become involved in the civil war.

Since 2012, hundreds of local councils have been formed in Syrian cities, towns and villages now free of the al-Assad regime. The councils provide essential public services, including water, electricity and street cleaning, as well as humanitarian relief, transportation, police and security. Local councils have different levels of independence and effectiveness due to varying circumstances on the ground. According to the National Coalition of the Syrian Revolution and Opposition Force, local councils fill the void in services left by the government and may become the foundation of a transitional government and future democratic elections. The local council goals are to:

- administer civil life, assist and monitor those working to provide services, and guarantee the quality and improvement of such efforts;
• distribute aid, whether from individuals, groups or nations, with “justice and transparency”;

• provide relief, medical, legal, reconstruction and media services, as well as civilian police forces; and

• become the nucleus of future municipalities in a transitional government and ultimately assist in the formation of an elected government.

Tunisia

Tunisia also has a long tradition of local governments, governed by elected municipal councils and with a formally clear set of responsibilities. However, a highly centralised oversight system — *tutelle* — has sharply constrained their decision making and independence. Currently, Tunisian policymakers are rethinking the relationship between central and local governments and have taken concrete steps towards a more decentralised system. The 2012 Development Strategy of the New Tunisia states that “the powers of regional and local authorities will be strengthened through the consolidation of decentralisation and governance, which requires strengthening and entrenching the concept of local democracy, the reconstruction of the legitimacy of the public from its local environment, and allowing regional and local councils to play the role of participants in the process of developing and initiating proposals for the development of different national policies”. Since the January 2011 revolution, Tunisia has signalled its intent to bring cities into the heart of the local development process, making them proactive players in planning, implementing and delivering municipal infrastructure and services. There is widespread recognition that local governments, with their elected municipal councils and mayors, must be more than “passive spectators” in urban development. Moreover, there is general consensus that local governments need to become more transparent and accountable to local citizens.

In Tunisia, recognition of the legal status of municipalities allows them to be seen as entities that are legally independent from the state, with their own capital, land and budget, financed by specific revenues. Under normal circumstances, Tunisian municipalities are governed by a council, directly elected for a five-year mandate, and an executive headed by the mayor, elected among the councillors (with the exception of the city of Tunis, where the mayor is named by decree among the councillors). Elected municipal councils and mayors, however, have always been subject to administrative supervision (*tutelle*), whereby key local government decisions (such as annual budgets, by-laws etc.) required approval from the state (in one form or another) before becoming effective.

For each governorate in Tunisia, the governor of the region, appointed by the president of the republic, is the chief of each ministry branch at the regional level. The governor is a representative of the state, chairing the regional council, which is also the executive body.

30The most recent municipal elections were held in May 2010, although following the January 2011 revolution, all municipal councils were dissolved and replaced by special delegations, members of which were nominated by a prime ministerial decree. It is expected that new councils will replace the special delegations following the next set of local elections, scheduled for 2015.
The regional council approves all central government projects at regional level, and the governor manages the budget of these projects. The governor has trusteeship over local authorities, and their powers over decentralised services have been extended.

Local governments in Tunisia have limited functional responsibilities. Municipalities are currently characterised by limited financial resources (municipal expenditures represent only 4 percent of total public spending), minimal control over their territorial and urban development, and a virtual lack of decision-making powers. Apart from administrative and vital registration services, the most important services delivered by municipalities are municipal solid waste collection and the construction and maintenance of municipal road networks. They are also responsible for urban parks, some cultural and sports facilities, and a few commercial facilities (such as food markets and slaughterhouses). The provision of electricity, water, wastewater services and urban transport are all the responsibility of the central government. In each of these areas, several key actors are involved (such as sector ministries or specialised agencies), with a limited consultative role devolved to local governments. In a relatively small country, this highly centralised, post-independence model of public investments has indeed provided most Tunisians with good access to basic infrastructure. However, centralisation now appears to be inappropriate, given the relative economic maturity of the country, political changes, greater local capacities, infrastructure maintenance requirements, and the need to sustain and improve the quality of services. Despite capital investments to support basic infrastructure delivery in urban areas, access to, and the quality of, municipal services are far from sustainable. Municipal service delivery is deteriorating in most cities, and particularly in regions that lag behind, with significant impacts on quality of life, the urban environment and public health, as well as on key economic activities such as tourism. Central government, and specialised agencies under its supervision, are responsible for all major municipal investments (water, sanitation, waste management, power distribution, transportation, culture, and rehabilitation of urban areas).

The new Constitution, promulgated on January 27, 2014, includes clear commitments to decentralisation and proposes fully devolved and empowered local governments with autonomy to execute their mandate to provide local services according to transparent principles of participation by, and accountability to, their citizens. The changes regarding local governance are transformational, as they effectively reverse the previous highly centralised structure, whereby central oversight and approval (tutelle) was exercised on all facets of local government accountability, decision making, and investments related to capital works and service delivery. The Constitution recognises the decentralisation processes as the fundamental basis for the organisation and distribution of power in Tunisia, and as an essential step towards achieving an administration that is more responsive and accountable to citizens. Chapter VII of the Constitution recognises that the decentralisation process is the essential starting point for more efficient administration that is more accessible to citizens, and also mandates free and transparent elections for local governments. The new Constitution also mandates that local governments will have their own legal personality in addition to administrative and financial competence and
autonomy. It is expected that the decentralisation process will be greatly supported by the international community\(^{31}\).

Each municipality has a municipal investment plan (PIC), which constitutes the principal vehicle for planning infrastructure investments at the local level.

However, while Tunisian municipalities vary in size, they have historically shared the common characteristics of limited decision-making powers, weak financial and managerial capacity, a relatively limited role in local development, and very limited connection with citizens. The challenges are especially acute in municipalities in disadvantaged regions.

Tunisian municipalities have not provided much in the way of “invited spaces”, within which citizens have been able to engage meaningfully with the “local state” or to voice their preferences and priorities. Issues of accountability and participation have now come to the fore, gaining added importance in the wake of a post-revolutionary crisis of political legitimacy, and a general deterioration in municipal services.

**Summary**

Decentralisation and multilevel governance are highly important to the progress of sustainable development in the MENA region. It is an old commitment, but one that has still not been satisfactorily developed. The model of decentralisation in the MENA region was the legacy of local government systems under the colonial powers before independence — that is, the Francophone system in North African countries (Algeria, Tunisia and Morocco), in which there was strong central government oversight; or even the legacy of the Ottoman Empire in Middle East countries. In general, the process of national state building reduced the role of local authorities in the past.

It is highly challenging to analyse governance structures in the MENA region, mainly due to differences in the countries’ political systems, which vary from the elective monarchy of Morocco and Jordan, or democratic systems like Tunisia’s, to military regimes as in Syria. The one combining element is the fact that a number of countries (such as Egypt, Syria and Jordan) have governance systems that are highly centralised, with most local governments dependent on central government transfers to finance their activities and services. However, in a number of countries—especially in North Africa—reforms have been initiated in order to decentralise their systems. Nevertheless, central governments often retain their authority through the control of financial resources.

\(^{31}\) In July 2014, the World Bank approved a USD 300 million programme focusing on improving the performance and local governance of municipalities, as a first step towards supporting the Tunisian national priority of decentralisation. The Urban Development and Local Governance Programme will encompass all of Tunisia’s 264 municipalities and support the government’s own 2014 to 2019 municipal investment plan. Along with initiatives to strengthen the financial and managerial capacities of local governments to improve their performance, the programme will promote the participation of local communities, including women and young people, in decisions on how public funds are allocated. The programme will also contribute to improving direct access to municipal services for about 500,000 inhabitants living in disadvantaged communities. The programme forms part of a proposed USD 1.2 billion financial package for Tunisia in 2014 announced by the World Bank — an amount four times more than the World Bank’s contribution to Tunisia in the pre-revolution period, and double the amount provided since.
Although all the states appear to have devolved power to local elected authorities, these organisations have in fact been kept under central government control via a number of means. In general, the central governments in MENA countries retain substantial powers to intervene in local affairs, mainly through the position of officials who are appointed by central government. The central government still retains the power to appoint governors and heads of local administrative units (this is the case in Egypt, for example) and holds the power to define their mandates. This means local authorities are accountable to the central government and not to the people. As a result, municipalities manage and implement central government programmes rather than their own, and are subject to the control of central government.

Municipal, provincial or regional-level institutions are often hybrid structures — that is, they are at the same time decentralised local authorities (with elected assemblies) and deconcentrated administrative units. In some countries (Morocco, Algeria), due to this duality, two different authorities function next to each other at the local government level. The central government is strongly represented at the local level in Morocco, as regional walis are appointed rather than elected. Central government officials (e.g. caïd and pacha at the local level, and governors and walis at the provincial levels in Morocco) are frequently heading both bodies and are the legal trustees (or guardians) of the local municipalities with a priori and/or a posterior control over municipal-level decisions and budgets. This is, in practice, the dominant level of local governance. The presence of deconcentrated offices of central ministries that provide important public services, including health, education and housing, reinforce their dominance. There is often competition between the two kinds of local institutions, which is further complicated by the division of tasks between officials at the different governance levels. As the jurisdictions are not clearly defined, this often results in overlaps, redundancy and conflict.

Local government responsibilities, enshrined in the Constitution and other laws, typically include urban planning, the issuing of building and construction permits, managing public markets and spaces, public health, water, electricity, sewerage and solid waste disposal, sports and cultural institutions, public hygiene, food safety, and the maintenance of cemeteries. Since the 1980s, decentralisation laws have combined varying degrees of political and administrative autonomy with central control over finances. The legal framework is, however, often unclear, referring to vaguely defined “local affairs”, which, in turn, refer only to residual responsibilities, dependent on the goodwill of central authorities, or, on the other hand, could be taken to encompass the whole gamut of local services, for which local financial resources are insufficient.

However, in particular as a result of recent political changes in the region, policymakers in MENA countries are rethinking the relationship between central and local governments, and have taken concrete steps towards a more decentralised system. As an example, since the January 2011 revolution, Tunisia has signalled its intent to bring local governments into the heart of the local development process, making them proactive players in planning, implementing and delivering municipal infrastructure and services. Such changes are accompanied by the decentralisation of certain responsibilities from central government agencies to regional, provincial and local authorities. There is widespread recognition that local governments need to become more transparent and accountable to local citizens. A new generation of national territorial planning tools is
more inclusive of local actors. In short, central authorities *de facto* determine local development plans and funding levels, although promising bottom-up planning reforms are currently underway.

However, these reforms have been counterbalanced by measures that in fact increase the power of supervision by centrally appointed government representatives. For example, the provincial governors (*walis*) in Algeria received increased powers in 2005, and the *wilaya*, which was previously regarded as a local authority, was turned into a deconcentrated administrative district.

**Decentralisation in the region has mainly been a top-down initiative.** Although decentralisation was frequently initiated and implemented as a result of international pressure and by international aid agencies, states’ involvement in decentralisation tends to reflect a more internal process, expressing a real need to develop local governance. This need has been initiated by central political authorities, rarely being formulated as a direct reclamation of control by local political societies.

The mismatch between functional devolution and fiscal centralisation constrains local governments. **Local authorities have a lack of financial power and a low level of local resources.** Throughout the MENA region, municipalities have permanent operational deficits. Many municipalities lack resources, face debt and are overstaffed with little productivity. There is also lack of cooperation among neighbouring municipalities, and a lack of technical expertise and transparency. Central transfers continue to be the main source of local finance, and the share of local expenditures in the GDP is still low. Moreover, financial transfers from the central government to local governments are unpredictable and irregular. The various local taxes, fees and permits that constitute the bulk of local revenues cover only a portion of the budget. For example, municipalities have only 10 to 15 percent of the state’s tax revenues in Algeria and only 3 percent in Jordan. Jordanian municipalities have revenue-raising powers, but most have problems in collecting fees and taxes from individuals. Central transfers and shared taxes collected by the treasury contribute the balance. The funding of local initiatives and projects is a pervasive problem. Capital improvements are financed in large part by the central government. The bulk of the municipal budget goes to salaries and operating expenditures for municipal services, such as the maintenance of the road system and public spaces, solid waste collection and some community facilities. The local government is limited (or incapable) in its capacity to set user charges for services.

Financial vulnerability and lack of human resources explains why the majority of responsibilities assigned to municipalities have remained fairly ineffective and their services insufficient.

Central government control does not mean that the decentralised functions do not work. It mainly signifies that the decentralisation process has not been followed through according to its natural progression and is undergoing a mixed deconcentration/delegation process in which most administrative, financial and political decisions are still made at the top. The outcome is that local authorities have learned to exert some key local functions, even if they have seen a shift in terms of responsibilities without the related changes in power.

**The quality of municipal planning remains a key challenge for municipalities throughout MENA.** Planning schemes are usually guided by the master planning approach (usually
called “general plans” or “comprehensive plans”), focusing almost exclusively on the spatial and physical planning of the city. There is a lack of consideration of stakeholder involvement by any means, because there is no mechanism for including them in the preparation or implementation of plans. Citizens’ needs and priorities are thus usually not well addressed in the plans. Strategic and investment planning at the local level is only partially required: in Morocco, for example, municipalities are legally required to systematically develop the planning function either through participatory medium-term investment plans or service plans, as in the case of municipal solid waste management. In Tunisia, municipal investment plans are obligatory. Other analysed countries do not have clear obligations to develop local strategic documents or plans. Internal planning capacities may vary, but in general they should be significantly upgraded in all analysed countries.

The following table presents the specific features of local responsibilities and power in some of the countries covered by the analysis.

<table>
<thead>
<tr>
<th>Country</th>
<th>Features</th>
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| Algeria    | - High level of centralisation; the decentralisation process follows the former pattern, also as a result of low turnout rates in local elections.  
- Central government still retains the power to appoint heads of local administrative units.  
- Local and regional governments are highly dependent on the state authorities and are thus demanding greater autonomy for communes, greater powers and responsibilities for locally elected representatives, and greater civic participation.  
- Funding shortages exist: municipalities have only 10% to 15% of the state’s tax revenues. |
| Egypt      | - Central government still retains the power to appoint governors and heads of local administrative units, and holds the power to define their mandates. This means local authorities are accountable to the central government and not to the people.  
- Corruption and a lack of technical capacity prevent elected local council representatives from effectively participating in local administration.  
- Political parties dominate and limit independent representatives and this “opens the opportunity for political alliances and agendas to supersede the public interest”. |
| Jordan     | - Many municipalities lack resources, face debt and are overstaffed with little productivity. There is also a lack of cooperation among neighbouring municipalities, and municipalities lack technical expertise and transparency.  
- Municipalities have revenue-raising powers, but most have problems in collecting fees and taxes.  
- There are no clear laws that designate the roles of municipalities and the central government through the appointed governors. |
| Morocco    | - Prefectures and provinces have limited power, almost no budgetary autonomy, and are tightly controlled by the central government.  
- Central government is strongly represented at the local level, as regional walis are appointed rather than elected.  
- Regionalisation and decentralisation, as stated by the new Constitution, must result in more than a shift of responsibilities. They should be accompanied by strong capacity-building efforts at the local level. |
| Tunisia    | - Local authorities have a lack of financial power in local assemblies and a low |
level of local resources. Their financial vulnerability and lack of human resources explains why the majority of responsibilities assigned to municipalities have remained fairly ineffective and why their services are insufficient.

- There is a lack of knowledge and information on general democratic principles and nuclear process by which marginalised groups such as young people and women can be engaged in and influence political processes.
- Civil society’s lack of capacity limits its effectiveness and influence.
Water resources and water issues in beneficiary countries

The MENA region is considered the most water scarce region in the world. The overarching water-related problem is that of water quantity — water is a scarce resource. However, water quality is also emerging as an important issue and is of growing concern to the public. Other characteristic features in the region are that water resources are often shared between two or more nations, and there is a heavy reliance on groundwater resources. Besides posing threats of its own, climate change will act as a multiplier of already existing stresses and further affect water availability and quality.

The current situation in terms of water resources and water use

The MENA region is naturally water scarce, yet water consumption is high. Currently, total water demand exceeds naturally available water supplies by almost 20 percent (World Bank 2012). Rainfall is low and variable, evaporation rates are high and droughts are frequent, all contributing to low water resource reliability and availability. Most of the region is classified as arid or semi-arid (desert), receiving less than 250 millimetres of rainfall annually. The National Rainfall Index[^32] is above the critical threshold (380 mm) in most of the countries covered by this study (excluding Lebanon).

![National Rainfall Index in selected MENA countries](image)

Source: AQUASTAT database, Food and Agriculture Organization of the United Nations (FAO).

In addition, MENA countries have to manage an unusual combination of low rainfall and high variability. The highest variability is found in the most arid countries, where average rainfall is so low that even modest rainfall can represent a huge variation on the mean, even though it might not pose a significant management challenge. Countries with this

[^32]: The National Rainfall Index is defined as the national average of the total annual precipitation weighted by its long-term average.
level of aridity concentrate on infrastructure that channels runoff when rainfall does occur, and dams that store water or encourage aquifer recharge. Countries that depend on water flowing in from other nations (Egypt and Syria among the countries analysed) may not have high levels of variability on their own territory but do experience the effects of variability in other territories. Variability is a particular challenge in those MENA countries that have just enough rainfall on average but where the patterns are irregular over time or space.

While the region has low water availability on average, the quantity of water available varies considerably among countries in the region (see Table 4 below).

Table 4. Total renewable water resources in countries covered by this study

<table>
<thead>
<tr>
<th></th>
<th>Surface water</th>
<th>Ground-water</th>
<th>Total</th>
<th>Total internally produced per capita (m$^3$/inhab/yr)</th>
<th>Total internally produced (billion m$^3$/yr)</th>
<th>Total external renewable water resources (billion m$^3$/yr)</th>
<th>Total renewable water resources (billion m$^3$/yr)</th>
<th>Total renewable water resources per capita (m$^3$/inhab/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>9.76</td>
<td>1.49</td>
<td>11.25</td>
<td>286.90</td>
<td>0.42</td>
<td>11.67</td>
<td>297.60</td>
<td>11.67</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.50</td>
<td>1.30</td>
<td>1.80</td>
<td>21.94</td>
<td>0.42</td>
<td>56.50</td>
<td>710.50</td>
<td>58.30</td>
</tr>
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<td>Libya</td>
<td>0.20</td>
<td>0.60</td>
<td>0.70</td>
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<td>0.70</td>
<td>112.90</td>
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<tr>
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<td>22.00</td>
<td>899.00</td>
<td>0.00</td>
<td>22.00</td>
<td>921.00</td>
<td>22.00</td>
</tr>
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<td>Tunisia</td>
<td>3.10</td>
<td>1.50</td>
<td>4.20</td>
<td>381.50</td>
<td>0.42</td>
<td>4.62</td>
<td>419.70</td>
<td>4.62</td>
</tr>
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<td>Jordan</td>
<td>0.49</td>
<td>0.45</td>
<td>0.68</td>
<td>93.76</td>
<td>0.26</td>
<td>0.94</td>
<td>128.80</td>
<td>0.94</td>
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<tr>
<td>Lebanon</td>
<td>4.10</td>
<td>3.20</td>
<td>7.13</td>
<td>995.40</td>
<td>-0.30</td>
<td>4.50</td>
<td>933.80</td>
<td>4.50</td>
</tr>
<tr>
<td>Syria</td>
<td>4.29</td>
<td>4.84</td>
<td>7.13</td>
<td>325.70</td>
<td>9.67</td>
<td>16.80</td>
<td>767.20</td>
<td>16.80</td>
</tr>
</tbody>
</table>

Source: AQUASTAT database, Food and Agriculture Organization of the United Nations (FAO)
Coupled with rapid population growth since the mid-1970s, these conditions have caused a dramatic shrinkage in per capita renewable water resources, from an average of 2,925 m$^3$ a year in 1962, to 1,179.6 m$^3$ in 1992 and an alarming 743.5 m$^3$ in 2011 below the threshold of 1,000 m$^3$ a year and far below the world average of 7,240 m$^3$ a year. The situation is even more alarming in most water-scarce countries in the MENA region — Algeria 297.6; Libya 112.9; and Jordan 128.8 m$^3$ per inhabitant per year — far less than the internationally recognised water stress threshold. All eight analysed countries already face water scarcity, with average water availability per capita below the poverty line of 1,000 m$^3$ a year. Half of them are under the 500 m$^3$ a year threshold set by the World Health Organization for severe scarcity; and two countries are below 200 m$^3$ a year.

MENA countries fall into three broad groups based on their primary water management challenges over and above those that all countries face, such as environmental protection, allocation and managing services: (i) countries with a high level of water variability; (i) hyper-arid countries; and (iii) countries characterised by transboundary water issues. The main features and water management challenges for each group are presented in Table 5.
Table 5. Categorisation of analysed countries in accordance with primary concerns in water management

<table>
<thead>
<tr>
<th>MENA countries (from among those analysed)</th>
<th>Primary concern in water management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries with a high level of water variability</td>
<td>Have adequate quantities of renewable water at the national level, but with variation between different parts of the country and over time.</td>
</tr>
<tr>
<td>Algeria, Lebanon, Morocco, Tunisia</td>
<td>• Internal distribution, both geographically and temporally</td>
</tr>
<tr>
<td>Hyper-arid countries</td>
<td>Have a consistently low level of renewable water resources.</td>
</tr>
<tr>
<td>Jordan, Libya</td>
<td>• Depend on non-renewable groundwater and augment supplies by desalination of sea or brackish water.</td>
</tr>
<tr>
<td>• Aquifer extraction management in order to avoid exhausting the resource and agricultural trade.</td>
<td></td>
</tr>
<tr>
<td>Countries characterised by transboundary water issues</td>
<td>Have a sizeable share of their water resources (rivers or aquifers) coming from other countries.</td>
</tr>
<tr>
<td>Egypt, Syria</td>
<td>• Affected by decisions made upstream or elsewhere in the aquifer.</td>
</tr>
</tbody>
</table>

By 2050, the water demand gap is projected to grow fivefold. Recent modelling exercises (Droogers et al. 2012) show that total internal renewable water resources and recharge show a significant decline in the future. This is the combined effect of changes in precipitation and evapotranspiration. It should be noted that although groundwater declines are severe, the contribution of groundwater compared to surface water is relatively small for the entire MENA region. Obviously, for some countries this decline in groundwater is one of the main threats to sustainable water resources. Total external renewable water resources show a very small increase for the entire region. Internal and external renewable water resources also show negative trends throughout the region, with the exception of Egypt and Syria. The largest decreases are observed in Jordan (~98 percent), and Morocco (~33 percent). In Syria, internal renewable water resources show an increase, although total renewable water resources show a decrease, because the external inflow of the Euphrates into Syria is projected to decrease by 17 percent (Droogers et al., 2012).

This already quite substantial unmet demand clearly reflects the conditions in MENA, in which water shortages are occurring in most countries. Today’s shortages are met primarily by unsustainably mining fossil groundwater reserves and partially by increasing water supplies through desalination.

A country overview of the current situation in terms of water resources in the analysed countries is provided below.
Algeria

Algeria is a desert country without rivers. The climate is semi-arid to arid north to south and the country is prone to water scarcity, thus water is rapidly becoming the key development issue. Algeria is Africa’s second most water scarce country (after Libya), with only 297.6 m³ available per person per year, well below the 1,000 m³ per year international water scarcity threshold. Water shortages, aggravated by regular droughts, are a major problem and a limiting factor in the availability of safe drinking water.

Potential water resources in Algeria are 19.2 billion m³ (surface water 12.4 billion m³ and underground water 6.92 billion m³, mainly in the Sahara). The national average rainfall is around 89 mm per year, well below the level required to sustain rain-fed agriculture. The average annual water crop is estimated at 100 billion m³, of which approximately 80 percent is lost as evapotranspiration. The underground aquifers in the north are exploited to 90 percent, with 2 billion m³ per year. The lack of surface water resources has culminated in the overexploitation of coastal aquifers and their contamination from saltwater intrusion. The Oranie and Chéliff water basins are the most affected by this phenomenon. Consequently, salinity affects irrigated agricultural land, which, in some instances, has become irreversibly sterile. In the Sahara region, the extracted volume is valued at 1.7 billion m³.

The country is divided into 17 major hydrographical basins, of which five are transboundary: the Medjerda basin is shared with Tunisia, and the Tafna, Draa, Guir and Daoura basins are shared with Morocco.

Table 6. Surface water by watershed in Algeria

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Oranie</th>
<th>Chott</th>
<th>Chergui</th>
<th>Che’liff</th>
<th>Chergui</th>
<th>Soumam</th>
<th>Hodna</th>
<th>Constantinois</th>
<th>Seybouse</th>
<th>Melle’gue</th>
<th>South</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>m³/year</td>
<td>1,025</td>
<td>1,840</td>
<td>4,380</td>
<td>4,500</td>
<td>600</td>
<td>12,345</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>8.7</td>
<td>15.7</td>
<td>37.3</td>
<td>38.3</td>
<td>0.48</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Egypt

Nile water comprises about 97 percent of the renewable water supplies in Egypt. Consequently, water resources in Egypt are confined to the withdrawal quota from Nile water; the limited amount of rainfall; the shallow and renewable groundwater reservoirs in the Nile Valley, the Nile Delta and the coastal strip; and the deep groundwater in the eastern desert, western desert and Sinai, which are almost non-renewable. Non-traditional water resources include the re-use of agricultural drainage water and treated wastewater, as well as the desalination of seawater and brackish groundwater.
Of the Nile’s average natural flow of 84.0 billion m$^3$ per year reaching Aswan, a share of 55.5 billion m$^3$ per year is allocated to Egypt according to the Nile Water Agreement (1959). This latter amount is constant, and incremental possibilities are not foreseen for the short term. This accounts for an average per capita share of about 710 m$^3$ per year (2012), while projections forecast a per capita share of about 600 m$^3$ per year by 2025.

Fossil groundwater is hosted in deep aquifers as a non-renewable water resource, and groundwater utilisation has been steadily increasing in Egypt over the last 20 years. There are four major groundwater systems in Egypt: the Nile Aquifer, the Nubian Sandstone Aquifer, the Moghra Aquifer, and the Coastal Aquifer. The Nile Aquifer is renewable and underlies the Nile Delta and is characterised by its high productivity and the shallow depth of the groundwater table, which make possible the abstraction of large quantities of water. The Nubian Sandstone Aquifer is shared by four countries (Egypt, Sudan, Chad and Libya). The whole aquifer contains about 150,000 billion m$^3$ of fossil water at depths reaching 2,000 m. Pumping costs and economies of scale control the development of groundwater from the Nubian Aquifer. The Nubian Aquifer also extends beneath the Eastern Desert. Recent studies show that the shallow aquifers at the middle and south of the desert are connected to the deep aquifer, thus providing a good potential for groundwater development. In the Moghra Aquifer, the groundwater flow is in general directed towards the Qattara Depression. The aquifer is recharged by rainfall and lateral direct inflow from the Nile Aquifer. Due to the sharp increase in abstraction for groundwater-based reclamation projects in the Egyptian Western Desert and industrial and municipal supply, notably on the western fringes of the Nile Delta, the quality and sustainability of this resource is at risk. Coastal aquifers exist near the north-western coast of Egypt and are recharged by rainfall on the western coast. Quantities that can be abstracted are limited due to the presence of saline water underneath the freshwater layers (Wagdy 2008).
Jordan

Jordan, one of the world’s most water scarce countries, consists almost entirely (92 percent) of desert. The annual per capita water share, at 129 m³, is far below the generally accepted per capita water poverty line. Moreover, according to the Ministry of Water and Irrigation of Jordan and the World Bank, per capita available water is projected to decline from the current low level to only 90 m³ per year by 2025. Groundwater resources have been abstracted beyond their safe yield. Surface water resources remain under threat due to the fluctuation of precipitation patterns that are becoming more severe, although every attempt has been made to maximise the amounts of captured surface water. The available renewable freshwater resources have decreased dramatically. Most of the significant amounts of surface water and groundwater flow from outside the country.

Jordan receives only 111 mm of precipitation per year (a decrease of 22 percent in total annual rainfall during the past 60 years), which is the lowest amount in the region.

The country’s total surface water area is 482 km², which is made up of base flow and flood flow, with the major resources originating in the Al Yarmouk River, the Zarqa River and the Jordan River. These sources provide Jordan with 37 percent of its total water supply. The source of the Yarmouk River is in Syria, and the river flows south to the Jordan River, with a total flow of about 171 million m³ per year.

The Zarqa River lies within Jordan and receives seasonal rainfall and treated wastewater, although it is subject to severe water pollution. The Jordan River starts in the Golan Heights and Lebanon and flows through the Sea of Galilee. It is shared by Lebanon, Syria, Israel and Jordan. The total flow of this river has decreased by 98 percent from its historical total flow to approximately 20 to 30 million m³ per year.

The rest of Jordan’s water supply comes from 12 groundwater basins. The combination of very low precipitation rates and low recharge rates in Jordan results in a relatively low renewable groundwater supply. According to the FAO AQUASTAT database, the country’s groundwater resources, some of which are non-renewable, are overexploited: in 2007, for example, 90 percent of actual freshwater resources were withdrawn, which makes water use highly unsustainable. The safe yield for the renewable groundwater basins is estimated to be 275 million m³ per year, and the average abstraction rate from these basins is estimated to be over 473 million m³ per year (Altz-Stamm, 2012).

Utilised water originates from various sources, including renewable and non-renewable groundwater, surface water in the form of baseflows and reservoirs, treated wastewater not flowing into reservoirs, and part of the additional water guaranteed by the 1994 peace treaty between Jordan and Israel. A third of Jordan’s renewable freshwater resources originate outside the country’s borders. Due to the scarce water supply, withdrawal rates are the lowest in the region, at approximately 160 m³ per capita. While agriculture constitutes two-thirds of all withdrawals, it only produces around 3 percent value added to Jordan’s GDP.

Lebanon

Lebanon is relatively well endowed with diversified water resources (934 m³ per inhabitant per year) compared to neighbouring countries, making the country the fourth
best endowed in MENA. Although Lebanon is known to be richer in water resources than most of its neighbours, these resources are unevenly distributed. Annual precipitation varies from 1,500 to 2,000 mm in the mountains to about 250 mm in the Beqa’a area. Most of the rainfall occurs during the winter season. The main water supply in Lebanon consists of melting snow from the mountains on the border of the country, which feeds the aquifers, rivers and seasonal streams. Seventy five percent of the flows occur between January and May, 16 percent between June and July, and 9 percent between August and October.

Lebanon has 16 perennial rivers and 23 seasonal rivers and its total annual river flow is about 3,900 million m\(^3\), of which an estimated 700 million m\(^3\) flow into neighbouring countries.

The total length of streams in Lebanon is 730 km, mainly on the western side of the mountains, which have steep slopes. Annual internal renewable water resources are estimated at about 4.8 billion m\(^3\). Annual surface runoff is around 4.1 billion m\(^3\), of which 2.5 billion m\(^3\) constitutes the base flow of the rivers. About one billion m\(^3\) of this flow comes from over 2,000 springs, with an average unit yield of about 10 to 15 l/s, sustaining a perennial flow for 17 of the total of 40 major streams in the country.

Based on the hydrographical system, the country can be divided into five regions:

- the Asi-Orontes Basin in the north — the Asi-Orontes River flows into Syria in the north-east of the country;
- the Hasbani Basin in the south-east — the Hasbani River, which flows into Israel in the south-east of the country, is a tributary of the Jordan River;
- the Litani Basin in the east and south — the Litani River reaches the sea in the south-west of the country;
- remaining major coastal river basins — the northern El Kebir River Basin is shared with the Syrian Arab Republic, the river itself forming part of the border between the two countries before flowing into the sea; and
- small, scattered and isolated sub-catchments remaining in between, with no noticeable surface stream flow, such as the endorheic catchments and isolated coastal pockets.

There is practically no dependency on external water resources and the withdrawal rate is around 30 percent.

Lebanon has two dams: Qaroun Dam on the Litani River; and Chabrouh Dam, which captures rain runoff and runoff from the Laban Spring. Their storage capacity is 220 million m\(^3\) and 8 million m\(^3\) (static storage capacity) respectively. At present, only 30 million m\(^3\) are being utilised from the Qaroun Dam for water supply and irrigation, the rest being used to generate electricity.

Primary groundwater and primary surface water account for 53.4 percent and 30.2 percent respectively of total water withdrawal. Recycled irrigation drainage accounts for 12.6 percent, desalinated water for 3.6 percent, and reused treated wastewater for 0.2 percent.
Surface water resources in Lebanon are largely exploited (the percentage of used water is about 50 percent) but with limited storage, while significant stress is put on groundwater mainly through private wells (more than 42,000 throughout the country, far more than average in the region). Over 50 percent of irrigation water comes from underground wells and boreholes, while 80 percent of potable water comes from groundwater sources.

Although coverage is better than the regional average, more than 50 percent of transmission and distribution networks are past their exploitation age (45 percent of transmission networks and 29 percent of distribution networks are older than 30 years), which leads to unaccounted-for water levels 13 percent higher than the world average.

Libya

Libya is one of the most arid regions on earth. With the exception of a narrow strip along the northern coast, which has a Mediterranean climate; the Libyan climate is mostly quite arid. Rainfall is limited to the coastal area, showing an average of 400 to 600 mm in Jabal al Akhadar region and dropping to 200 to 400 mm on the north-west coast. Rainfall declines rapidly inland, and in the desert zones is negligible.

The growth in water demand has a marked impact on Libya’s water resources, which have suffered serious depletions and quality deterioration. Seasonal changes in precipitation affect the supply of surface runoff through their impacts on precipitation efficiency, which depends mainly on temperature and evaporation. Deficient precipitation is reflected by an absence of permanent rivers or streams in Libya. The total mean annual runoff in the dry wadis in the northern parts of Libya is controlled by annual precipitation. For example, El-Majenin Lake does not store constant water every year from precipitation; part of it either evaporates or contributes to recharge groundwater aquifers.
amount of surface water varies sharply due to precipitation. In humid years, a large amount of water can be stored.

Libya has four main water basins (Figure 17):

- The western aquifer system, including three interconnected sub-systems:
  - the Murzuq Basin;
  - Jabal Hasawnah; and
  - Al Hamadah al Hamra system;
- the Jefarah Plain system;
- the Al Sarir-Al Kufrah Basin system; and
- the Al Jabal al Akhdar system.

<table>
<thead>
<tr>
<th>Water basin</th>
<th>Surface water resources (million m³/yr)</th>
<th>Groundwater resources (million m³/yr)</th>
<th>Unconventional water resources (million m³/yr)</th>
<th>TOTAL (million m³/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jefarah Plain</td>
<td>200.0</td>
<td>52.0</td>
<td>27.5</td>
<td>279.5</td>
</tr>
<tr>
<td>Al Jabal al Akhdar</td>
<td>200.0</td>
<td>92.0</td>
<td>45.5</td>
<td>337.5</td>
</tr>
<tr>
<td>Al Hamadah al Hamra</td>
<td>230.0</td>
<td>48.0</td>
<td>50.5</td>
<td>328.5</td>
</tr>
<tr>
<td>Al Sarir-Al Kufrah</td>
<td>563.0</td>
<td>-</td>
<td>-</td>
<td>563</td>
</tr>
<tr>
<td>Murzuq</td>
<td>771.0</td>
<td>-</td>
<td>-</td>
<td>771</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,964.0</td>
<td>192.0</td>
<td>123.5</td>
<td>2,279.5</td>
</tr>
</tbody>
</table>

The lack of surface water resources, the limited annual rainfall, and escalating water demands during the past few decades have led to the pumping and overexploitation of the local groundwater aquifers. In north-western Libya there has been a dramatic decline in water levels in both shallow and deep aquifers during the last decades. The shallow aquifer that was the origin of the agricultural development of the Jefarah Plain is now almost depleted in the area south of Tripoli. In the coastal areas, both the size and the annual recharge rates of these aquifers are limited. In several locations they have been exposed to piezometric decline and seawater intrusion (Wheida 2012). For example, the decline in water level has resulted in severe seawater intrusion along the coast from Zanzur to Tajurah, where the groundwater is now unusable. Lack of water resources has intensified withdrawals for irrigation, leading to a significant increase in the salinity of groundwater (Al Jabal Al Akhdar).

As a result of water depletion in the coastal region, in 1983 a massive engineering project, known as the Great Manmade River Project, was launched to supply water from desert aquifers to the coastal region for the majority of Libya’s growing population, and to expand agriculture through irrigation. The project currently extracts 2.5 million m³ of water per day (expected to reach 6.5 million per day) from 1,100 wells and through 4,000 km of pipelines. Given the recent developments in Libya, the project’s future is in question.
Morocco

Morocco is characterised by the uneven distribution of water both spatially (asymmetry may be observed among water basins in the course of the hydrological year) and temporally (annual precipitation may diverge significantly, almost on a 1:10 ratio), and this is the main feature of the hydrological regime. Furthermore, Morocco has experienced severe droughts in recent decades with occasional extreme precipitation episodes and disastrous flash floods. Water quality is also questionable.

According to estimates, Morocco has an average annual renewable water resource potential of almost 22 billion m$^3$, of which approximately 18 billion m$^3$ are surface water and 4 billion m$^3$ groundwater. Average annual rainfall is 140 billion m$^3$, but can vary from 50 billion m$^3$ to 400 billion m$^3$. The country’s internal annual renewable freshwater resources per capita are 899 m$^3$ (2011) and are projected to decrease to 508 m$^3$ in 2020, which is well below UNDP’s 1,000 m$^3$ scarcity threshold. Evapotranspiration is high: evaporation and transpiration losses are, on average, 118 billion m$^3$ per year.

Morocco is divided into seven major river basins, as shown in Table 8, as well as a number of smaller basins. Freshwater recharge is estimated at 22 billion m$^3$ per year, of which 18 billion m$^3$ per year come from surface water and 4 billion m$^3$ per year from groundwater. Surface water resources are characterised by high variability: resources for nine years out of ten, or four years out of five, are significantly below this average. Surface water inflows reach several million cubic metres for basins with the least water in average years. This runoff is largely due to rapid and powerful floods. They are generally recorded during an average estimated period of 20 to 30 days for the basins in southern Morocco, and two to three months for basins in northern Morocco and the Moulouya River region. In a drought year, water inflow can drop to under 30 percent of this mean value. Managing the uneven distribution of water resources in time and space has involved the construction of large dam reservoirs for storing the inflow from wet years to be used in dry years and transferring water from regions with surplus water to regions with water shortages in order to encourage balanced economic and social development across the whole of Morocco. The mobilised potential still available from conventional surface water sources is rather limited. It is certain that between 80 and 90 percent of economically accessible surface water resources have already been regulated through dams and inter-annual storage reservoirs in Morocco.

34 Among the water basins, the Loukkos, Tangier and Mediterranean coast basins present the highest value, at 1,350 m$^3$ per capita per year; the Bouregreg and Saharan regions illustrate the lack of regional homogeneity, having only 130 m$^3$ to 140 m$^3$ per capita per year. An important water balance deficit is also noted in Oum Er-Rbia.
Table 8. River basins in Morocco

<table>
<thead>
<tr>
<th>Area</th>
<th>Surface area (km²)</th>
<th>Average surface water runoff (mm³/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loukkos, Tangier and Mediterranean coastlines</td>
<td>12,800</td>
<td>3,600</td>
</tr>
<tr>
<td>Sebou</td>
<td>40,000</td>
<td>5,600</td>
</tr>
<tr>
<td>Moulouya, Figuig, Kert, Isly and Kiss</td>
<td>76,664</td>
<td>1,610</td>
</tr>
<tr>
<td>Bou Regreg and Chawia</td>
<td>20,470</td>
<td>847</td>
</tr>
<tr>
<td>Oum Er-Rbia and El Jadida-Safi</td>
<td>48,070</td>
<td>3,447</td>
</tr>
<tr>
<td>Tensift and Ksob-Igouzoulen</td>
<td>24,800</td>
<td>872</td>
</tr>
<tr>
<td>Souss-Massa-Draa</td>
<td>126,480</td>
<td>1,398</td>
</tr>
</tbody>
</table>

Potential groundwater resources are estimated at around 4,105 million m³ per year, of which 1,017 million m³ per year come from irrigation water returned via surface water in particular. Groundwater has been consumed at a high rate of around 4.2 billion m³ per year, a value 10 percent higher than the average annual replenishment, leading to water destocking estimated at 0.9 billion m³ per year. This extraction has led to a rapid drop in the water table, at a rate of 2 m per year on average. Unsustainable abstraction rates have been used in several aquifers (Saïss, Souss, Témara, Haouz and South Atlas). Aquifer overexploitation is endangering the socioeconomic development of rural areas, creating a dysfunctional ecological situation, and increasing desertification.

Wastewater potential is evaluated at around 485 million m³ for 2010 and 700 million m³ for 2030, of which approximately 60 percent is discharged directly into the sea. Morocco is only just starting to produce freshwater by desalination or demineralisation. For the moment, this is only used for urban water supply in the Saharan provinces (El Aaiun, Tarfaya, Smara and Boujdour). Overall production capacity is already around 16,500 m³ per day. In addition, around a quarter of groundwater is, either in whole or in part, brackish water. This water is mostly situated in the country’s desert and semi-desert regions.

Since the 1960s, Morocco has adopted an appropriate policy of water resources development focused on the construction of dams, which has provided drinking water supply security for all the towns and cities in the country and made it possible to develop approximately 1,500,000 ha of irrigated land, of which approximately 700,000 ha are part of large irrigated areas.

Syria

Syria is not among the most water poor countries in the Middle East, although the per capita availability of renewable water resources (at 767.20 m³ per year in 2008) is below the water scarcity limit. A water crisis has been building for years, and most of the country has been suffering from droughts in the last decade. The only exceptions are the coastal region and the Euphrates Basin, which carry surplus water. Average annual rainfall varies from 1,000 mm in the northern coastal area to less than 200 mm in arid regions. Total renewable freshwater resources are around 16 million m³ per year. In many areas, especially near Damascus, the groundwater is polluted, and fields lie abandoned as a consequence of water shortages.
There are 16 rivers and tributaries that flow in Syria. There are also five lakes, the largest being Jabboul Lake near Aleppo. The most prominent lake is Al-Assad Lake. Among the rivers, six are transboundary:

- the Euphrates, which enters the country from Turkey and flows to Iraq over 680 km in Syria;
- the Afrin in north-western Syria, which enters Syria from Turkey and returns to the Alexandretta region that borders Turkey and Syria;
- the Orontes, which originates in Lebanon and flows through Syria into Turkey;
- the Yarmouk in south-western Syria, with sources in Syria and Jordan, which forms the border between these countries before flowing into the Jordan River;
- the Khabour, which originates in Turkey and merges with the Euphrates; and
- the Tigris, which forms the border between Syria and Turkey in the far north-eastern part of the country.

Table 9. Water resources in major water basins in Syria

<table>
<thead>
<tr>
<th>Water basin</th>
<th>Surface water</th>
<th>Groundwater</th>
<th>Total</th>
<th>Rate of regulation</th>
<th>Available regulated water resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barada and Awai</td>
<td>19</td>
<td>774</td>
<td>793</td>
<td>90</td>
<td>714</td>
</tr>
<tr>
<td>Yarmouk</td>
<td>168</td>
<td>249</td>
<td>417</td>
<td>85</td>
<td>354</td>
</tr>
<tr>
<td>Badia</td>
<td>152</td>
<td>168</td>
<td>320</td>
<td>60</td>
<td>192</td>
</tr>
<tr>
<td>Orontes</td>
<td>1,036</td>
<td>1,499</td>
<td>2,535</td>
<td>85</td>
<td>2,155</td>
</tr>
<tr>
<td>Coastal</td>
<td>1,453</td>
<td>726</td>
<td>2,179</td>
<td>65</td>
<td>1,416</td>
</tr>
<tr>
<td>Tigris–Khabour</td>
<td>735</td>
<td>1,493</td>
<td>2,228</td>
<td>95</td>
<td>2,117</td>
</tr>
<tr>
<td>Euphrates–Aleppo</td>
<td>7,073</td>
<td>346</td>
<td>7,419</td>
<td>98</td>
<td>7,271</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10,636</td>
<td>5,255</td>
<td>15,891</td>
<td></td>
<td>14,219</td>
</tr>
</tbody>
</table>

Source: Ministry of Irrigation
Syria is highly dependent on external renewable water resources, mainly flowing from Turkey, with a dependence ratio of 72.

**Tunisia**

As an arid to semi-arid country, Tunisia is facing water shortages of increasing severity. Most regions in Tunisia have modest rainfall: only one-third of the territory benefits from 400 mm per year, while two-thirds receive less than 400 mm per year. Rain is concentrated between May and September, with a limited number of days receiving rainfall. Two-thirds of the country, for example, receives an average of less than 50 days of rainfall. Tunisia, like all countries in the MENA region, is characterised by overall water scarcity. Even without the impacts of climate change, Tunisia already faces an increasing scarcity of water resources and a number of challenges in the water sector.

Water scarcity problems are expected to intensify as a result of population growth, rising living standards and accelerated urbanisation. These drivers put considerable pressure on available resources and on the agricultural sector, leading to a significant increase in water use and pollution loads.

The escalation of urban water demand has led to an increasing use of freshwater for domestic purposes and to the production of large volumes of wastewater. In turn, this has a significant impact on the allocation of water for crop irrigation: the agricultural sector is expected to face significant water quantity and quality problems, given that the volume of freshwater that becomes available for crop irrigation is decreasing. Furthermore, there is growing competition over available resources near large urban centres.

In the above context, policy makers have been compelled to develop additional resources, and to take measures towards water resource conservation. Currently, the main components of the National Water Resources Management Strategy are gradually shifting towards surface water mobilisation, soil and water conservation works, water harvesting, and the use of non-conventional water resources, such as the re-use of treated wastewater for crop irrigation and aquifer recharge.

On a national scale, water resources are distributed unequally (see Table 10). In most regions precipitation is insufficient and unpredictable, and it is unevenly distributed across regions. Groundwater supplies a large part of water resources, whether for drinking or agriculture. The country belongs to the so-called variability group of countries in North Africa, which consists of countries that have more or less adequate quantities of renewable water at the national level, but with high levels of variation between different parts of the country and over time. The primary concern is therefore internal distribution, both geographically and temporally. Climate change is predicted to increase the natural variability of precipitation regimes in Tunisia, along with a predicted overall decrease in mean annual precipitation, which will make water management increasingly difficult for water and agriculture planners.
Table 10. Geographical distribution of different categories of water in Tunisia

<table>
<thead>
<tr>
<th></th>
<th>Far north</th>
<th>North</th>
<th>Centre</th>
<th>South</th>
<th>Country total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional surface (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Supply of surface water (million m$^3$)</td>
<td>3</td>
<td>62</td>
<td>120</td>
<td>180</td>
<td>2,700</td>
</tr>
<tr>
<td>Groundwater (million m$^3$)</td>
<td>395</td>
<td>216</td>
<td>108</td>
<td>719</td>
<td></td>
</tr>
<tr>
<td>Deep groundwater (million m$^3$)</td>
<td>269</td>
<td>326</td>
<td>822</td>
<td>1,417</td>
<td></td>
</tr>
<tr>
<td>Total potential resources (million m$^3$)</td>
<td>2,854</td>
<td>862</td>
<td>1,120</td>
<td>4,836</td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>59</td>
<td>18</td>
<td>23</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Source: DGRE, data for 1995

Tunisia is divided into seven river basin districts, which include several river basins:

- Basin 1, which covers the northernmost part of the country;
- Basin 2, which comprises the Cap-Bon watershed and the Milienne River;
- Basin 3, corresponding to the Medjerda River watershed, which is the most important river basin in Tunisia;
- Basin 4, which corresponds to the central part of the country (Zeroud, Merguellil and Nebhana rivers);
- Basin 5, which comprises the Sahel of Sousse and Sfax;
- Basin 6, which expands from the southern limit of Basin 4 and the Sahel up to the north of Chot el Jerid; and
- Basin 7, which covers the southernmost part of the country, up to the Algerian and Libyan borders.

Tunisia irrigates 416,224 ha, which is 4 percent of its total agricultural area. In 56 percent of the irrigated area (368,000 ha), irrigation infrastructure has been developed by the state. These areas are managed either by state agencies or by farmers. Large-scale schemes have been created below dams (125,000 ha). Medium- and small-scale public schemes have been organised around deep tube-wells (82,000 ha) or the re-use of treated sewage effluent (7,000 ha). Private small-scale systems manage shallow wells (140,000 ha), deep tube-wells (10,000 ha) or river diversions (10,000 ha).

Access to drinking water reached 100 percent in urban areas in 2011 and 93.5 percent in rural areas, connection rates that are close to those observed in OECD countries and very high compared with the average for the North Africa region.

**Water demand and deficit**

The nexus of food security and water is clearly a vital one in the region. However, food security (at national or household scale) is not the sole driver of water policy and management in the region. Economic and social drivers for jobs, employment, income and export earnings, inter alia, all also have an influence on water use and reform processes, not just among the rural agricultural population but also among urban-based non-agricultural populations. Major gains have been made in drinking water coverage, but
more remains to be done, especially in relation to those without access, and to sanitation and hygiene.

Table 11. Water withdrawal by sector in countries covered by the study

<table>
<thead>
<tr>
<th>Country</th>
<th>Agricultural (billion m³ per year)</th>
<th>Industrial</th>
<th>Municipal</th>
<th>Total withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>3.50</td>
<td>0.95</td>
<td>1.58</td>
<td>6.03</td>
</tr>
<tr>
<td>Egypt</td>
<td>59.00</td>
<td>4.00</td>
<td>5.30</td>
<td>68.30</td>
</tr>
<tr>
<td>Libya</td>
<td>3.58</td>
<td>0.13</td>
<td>0.61</td>
<td>4.33</td>
</tr>
<tr>
<td>Morocco</td>
<td>11.01</td>
<td>0.48</td>
<td>1.63</td>
<td>13.11</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2.17</td>
<td>0.11</td>
<td>0.37</td>
<td>2.64</td>
</tr>
<tr>
<td>Jordan</td>
<td>0.61</td>
<td>0.04</td>
<td>0.29</td>
<td>0.94</td>
</tr>
<tr>
<td>Lebanon</td>
<td>0.78</td>
<td>0.15</td>
<td>0.38</td>
<td>1.31</td>
</tr>
<tr>
<td>Syria</td>
<td>14.67</td>
<td>0.62</td>
<td>1.48</td>
<td>16.76</td>
</tr>
</tbody>
</table>

Source: AQUASTAT database

The World Bank has delineated overall water policy in MENA countries into three phases:

- the “traditional” phase that evolved over millennia, characterised by the efforts of societies to adapt to the variability and scarcity of water;
- the 20th century, when the public sector took the lead in managing huge investment programmes (dams), and when water supply and sanitation services and irrigation networks became more extensive; and
- the period after the 1960s, when low-cost drilling technology became available, and individuals began tapping into aquifers on a scale that overwhelmed the capacity of regulators to control extraction.

As a consequence, the MENA region is using more of its renewable water resources than other regions, as can be seen from Figures 18, 19 and 20, and Table 12.
Table 12. Water withdrawal by source (billion m$^3$)

<table>
<thead>
<tr>
<th>Country</th>
<th>Surface</th>
<th>Groundwater</th>
<th>Total</th>
<th>Desalinated water produced</th>
<th>Direct use of treated municipal wastewater</th>
<th>Direct use of agricultural drainage water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>5.71</td>
<td></td>
<td>57.23</td>
<td>0.10</td>
<td>0.7</td>
<td>10.97</td>
</tr>
<tr>
<td>Egypt</td>
<td>7.04</td>
<td>0.02</td>
<td>57.23</td>
<td>0.10</td>
<td>0.7</td>
<td>10.97</td>
</tr>
<tr>
<td>Jordan</td>
<td>0.31</td>
<td>0.55</td>
<td>0.87</td>
<td>0.01</td>
<td>0.0649</td>
<td></td>
</tr>
<tr>
<td>Lebanon</td>
<td>0.40</td>
<td>1.10</td>
<td></td>
<td>0.05</td>
<td>0.002</td>
<td>0.165</td>
</tr>
<tr>
<td>Libya</td>
<td>0.00</td>
<td>4.31</td>
<td>4.31</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morocco</td>
<td>9.43</td>
<td>3.17</td>
<td>12.60</td>
<td>0.01</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Syria</td>
<td>14.14</td>
<td></td>
<td></td>
<td>0.55</td>
<td>2.246</td>
<td></td>
</tr>
<tr>
<td>Tunisia</td>
<td>0.94</td>
<td>1.90</td>
<td>2.81</td>
<td>0.01</td>
<td>0.068</td>
<td></td>
</tr>
</tbody>
</table>

Source: AQUASTAT database

Figure 19. Freshwater withdrawal as a percentage of total actual renewable water resources

Based on the average for 2000–2009, the current annual water shortage in the MENA region is approximately 42 billion m$^3$ (World Bank 2012). Current total water demand exceeds naturally available water supplies by almost 20 percent. Within that period, however, year-to-year variations were quite large (from 24 billion m$^3$ in 2004 to 64 billion m$^3$ in 2008). There is already a significant deficit, which is covered by seawater desalination based on fossil fuels and by the overexploitation of groundwater resources, with the consequence of subsequently dropping groundwater levels, the intrusion of salt water into the groundwater reservoirs, and desertification in many areas in MENA.
The MENA water demand situation is characterised by several facts that at a first glance seem to be rather paradoxical. On the one hand, there is a severe water shortage, with the region as a whole on average living beyond the commonly accepted water poverty level of 1,000 m³ per inhabitant per year. On the other hand, there is a dominant agricultural production sector that, due to the arid climate in the region, consumes more than 85 percent of the available natural renewable water resources. This situation is made more acute by the strongly growing population, which will double in the first 50 years of the 21st century.

Water demand will increase in the MENA region for all countries as a result of the higher evaporative demand of irrigated agriculture and the increase in domestic and industrial needs. Overall, this demand will increase by approximately 25 percent between 2020 and 2030, and by approximately 60 percent between 2040 and 2050 (World Bank, 2012). The FAO has also concluded that water shortage in the MENA region will be enormous in the next decades. Eighty percent of that shortage will be attributable to a steep increase in demand owing to strong population growth and fast economic development (including the rising demand of a wealthier middle class with different dietary habits), while about 20 percent may be attributed to climate change. However, large variations occur, with countries with relatively high domestic and industrial demand showing larger proportional increases compared to other countries. The larger countries with extensive agricultural demand account for the majority of the increased future demand.
Algeria

The water supply and demand balance in Algeria is in serious deficit. The country is already facing a water balance deficit. The availability of conventional water resources is affected by growing water demand and the deterioration of surface water and groundwater quality. Climate change is exacerbating the situation. The country has one of the highest average population growth rates in the world (at around 1.17 percent) and scarce natural water supplies. As a result, annual per capita renewable available water in Algeria has dropped from an average of 1,500 m$^3$ in 1962 to 297 m$^3$, placing Algeria in the category of extremely poor countries in terms of water resources and below the 1,000 m$^3$ per capita per year shortage threshold. The average availability for domestic consumption is 55 litres per inhabitant per day, and water is usually cut off in almost all cities.
Table 13. Current and future water demand and the unmet demand gap under an average climate projection in Algeria

<table>
<thead>
<tr>
<th>Demand (billion m$^3$)</th>
<th>Unmet (billion m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>6,356</td>
</tr>
</tbody>
</table>

With 71 dams with a capacity of 7.1 billion m$^3$, Algeria has almost reached mobilisable water potential. The rate of groundwater exploitation in the north of the country has reached about 90 percent, at nearly 2 billion m$^3$ per year. Some aquifers are already overexploited. To ensure that consumption needs are met, the country has desalinated seawater in recent years, with a production capacity of nearly 2 million m$^3$ per day.

Agricultural irrigation is the primary water-consuming sector, followed by the domestic and industrial sectors. Water allocated for irrigation dropped from 80 percent in 1960 to around 60 percent in 2002.  

Egypt

Egypt is experiencing water stress under the increasing demand for water due to population growth and rising standards of living. Unmet water demand in 2009 was estimated at almost 3 billion m$^3$, and the figure is expected to rise tenfold in 2050.

The agricultural, drinking water and industrial sectors are the highest water consumers. The agricultural sector is the largest user and consumer of water in Egypt, and its current allocation (67 billion m$^3$ in 2010) exceeds 68 percent of the total freshwater supplies, or 82 percent of total used water (after recycling). Compared to agricultural water demand, municipal water demand is relatively small. However, given the health aspects involved, the municipal supply receives priority over all other uses.

Table 14. Current and future water demand and the unmet demand gap under an average climate projection in Egypt

<table>
<thead>
<tr>
<th>Demand (million m$^3$)</th>
<th>Unmet (million m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>55,837</td>
</tr>
</tbody>
</table>

Municipal consumption in the 2010 water budget was 1.80 billion m$^3$, while the corresponding allocated amount was 9 billion m$^3$ (according to the 2050 Water Strategy). These high losses may be attributed to the ageing of the infrastructure, a lack of awareness, and low water tariffs. The allocation of municipal water is higher in urban areas than in rural areas. The average per capita usage of drinking water for the overall country is about 300 litres per day, which is very high under any standards, and especially for a country subject to water poverty and the threat of water scarcity. Huge efforts are

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needed to use municipal water supplies in a conservative manner. According to the above-mentioned consumed amount of drinking water, the overall daily average consumption per capita is about 60 litres (MWRI 2013).

There is no accurate estimate for current industrial water requirements. However, the 2050 Water Strategy estimated industrial water consumption in 2010 at about 1.40 billion m$^3$, and total usage at about 3.80 billion m$^3$. It also estimated that 1.80 billion m$^3$ are taken from the drinking water networks, and the remainder from the Nile, canals and groundwater (MWRI 2013).

Competition among demands will intensify under climate change, although drinking water will always have the highest priority. Drinking water supplies and the number of wastewater treatment plants have increased significantly in the last few decades. The percentage of people receiving sanitary drinking water increased from 75 percent in 2006 to 88 percent in 2010, and current plans are to have 100 percent coverage.

The level of water pollution in Egypt is high and contributes to many premature deaths and morbidity. About 17,000 children per year, one-fifth of all childhood deaths, are estimated to result from poor water quality, inadequate hygiene and poor sanitation (World Bank 2002). Pollution also contributes to high levels of infectious diseases among children and adults, particularly diseases caused by worms and other parasites.

Jordan

Demand for water exceeds Jordan’s available water resources. The combination of water scarcity and increasing water demand have increased pressure on non-renewable aquifers and intensified Jordan’s dependence on water sources shared with its neighbours. Currently, aquifers are being extracted at rates far exceeding the natural recharge rate, which has led to a noticeable lowering of Jordan’s water tables and a major accompanying decline in water quality. These problems have resulted in an increase in tensions and disputes over water access within and outside of Jordan.

![Pie chart showing the structure of water consumption in Jordan in 2000](image)

Source: AQUASTAT database

Figure 23. The structure of water consumption in Jordan in 2000
Current annual water consumption is estimated to be 940 million m$^3$. There is consequently a gap between demand and supply, which evidence suggests has been widening rapidly in recent years.

The industrial and municipal sectors, including the tourist sector, together consume 28 percent of Jordan’s water supply, while agriculture/irrigation consumes 72 percent (Jordan’s Water Strategy 2008–2022). Total municipal and tourist water use has increased significantly during the past decades, from approximately 116 million m$^3$ in 1985 to 249 million m$^3$ in 2002. Increased income and changes in lifestyle have contributed to this increased water consumption, especially in the urban areas of Greater Amman, Irbid and Aqaba.

Water consumption in Jordan’s industrial sector is limited to nine big industries, located in five governorates and consuming about 86 percent of the total water used by all industries. Both industrial and municipal water uses are expected to rise to meet the demands of a growing and increasingly urbanised population and the increasing importance of industry in the economy.

Water for irrigation utilises 72 percent of the water demand and 64 percent of water supply (Ministry of Water and Irrigation, data from 2007), with most irrigation occurring in two distinct areas: the Jordan Rift Valley and the Uplands. As municipal, industrial and tourism water use increases, irrigated agriculture in the highlands will need to be capped and regulated, and by-laws will need to be reinforced.

![Water use by sector in Jordan 1985-2020](image)

Figure 24. Water use by sector in Jordan (1985–2020)

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36 At the same time, according to FAO data, agricultural production accounted for only 3 percent of GDP in Jordan in 2007, decreasing from 6 percent in 1992.
The demand for water has been growing rapidly in recent years and the current estimated demand is in excess of the total water currently available. Most of the increase in water demand can be attributed to households and municipal consumption. This has resulted from both the higher number of people in the urban areas and the greater water demand resulting from higher standards of living. Increases are expected to continue as urban populations rise and people demand more water to meet their needs. Moreover, according to current governmental policy in the water sector, municipal demand is considered the highest priority. However, Jordanians receive water once per week for a limited number of hours and use roof tanks to store their weekly needs. This intermittent supply regime also creates additional risks that may compromise water quality.

Severe competition among sectors has arisen due to the exponential rise in water demand. Industrial water demand is expected to increase by 300 percent within 10 years, and commercial (including touristic) demand by 200 percent, competing with increasing domestic demand. Despite the decline in irrigation water use in recent years, it is expected to increase in the future due to increasing demand for food production and the expected rise in the availability of non-conventional water sources, such as treated wastewater, rainwater harvesting and the desalination of seawater.

Table 15. Current and future water demand and the unmet demand gap under an average climate projection in Jordan

<table>
<thead>
<tr>
<th>Demand (million m$^3$)</th>
<th>Unmet (million m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jordan</td>
<td>1,113</td>
</tr>
</tbody>
</table>

Water scarcity in Jordan has been exacerbated by the Syrian refugee crisis. Jordan has experienced several waves of refugees entering the country over the past decades, the latest influx of Syrian refugees being the largest. The increase in demand from the burgeoning Syrian refugee population has had an impact on the amount and frequency of water available for Jordanians. Almost all Jordanians can access water, but the quantity supplied per capita has recently decreased, in some cases even to 30 litres a day (one-third of the threshold limit). Water has also been supplied to consumers with reduced frequency (e.g. in some of the northern governorates from once per week to once per month). Furthermore, groundwater in certain areas is depleting at a rate of 1 to 1.2 m per year.

Surface water appears to be of acceptable quality, although there are important problems in terms of salinity and bacteriological contamination of a localised nature (e.g. in the King Abdullah Canal, located upstream of important irrigation schemes in the Jordan Valley) (World Bank 2010). The overall decline in fresh surface water resources observed in recent years (and due, in particular, to the drying up of the Yarmouk River baseflow) may have significant implications for surface water quality. However, evidence suggests a simultaneous trend of declining groundwater tables and increasing salinity in most aquifers. Moreover, the salinity of many groundwater resources is rapidly approaching the limits for drinking water supply.
Access to sanitation is relatively high (with some exceptions in rural governorates: only 8 percent in Mafraq; 20 percent in Karak, 31 percent in Tafilah and 32 percent in Madaba), and the quantity of municipal wastewater collected and treated has been steadily increasing (overall access to sanitation has increased from 48 percent in 2000 to 63 percent). The quality of treated wastewater, however, is deteriorating: about 50 percent of total wastewater treated does not appear to meet national quality norms for pollutants (World Bank 2010). The number of people who gained access to public wastewater services in the near past has generally been lower than the increase in the number of the population. Poorly managed cesspools are the most common alternative for wastewater disposal. This has been a cause for concern, as seepage from cesspools has contaminated scarce freshwater resources and created several negative health and environmental impacts. Around one-third of the population use unsealed cesspits for dumping wastewater. This modest overall sewerage coverage is due to the high costs involved when considering the capital investment associated with treatment plants and creating sewerage networks and house connections. The situation is relatively harder in rural areas, due to the small clusters of people distributed over a large area of land.

Only 28 percent of total industrial wastewater is treated (50 percent excluding wastewater from potash mining, which is likely to have limited environmental impacts). An estimated 25 percent of industrial wastewater is discharged into the sewerage network, although the quality of the effluent is of concern because of high rates of discharge without licensing and low rates of compliance with applicable regulations (over 30 percent for ammonia and suspended solids). With respect to the 30 percent of wastewater not disposed of in sewers, monitoring of effluent quality is limited and does not include important toxic substances (World Bank 2010). The disposal of wastewater through tankers is a widespread practice, virtually unmonitored in terms of effluent quality and likely to pose health risks where wastewater is disposed of in unlined landfills (such as Al-Ekeider), with resulting possible infiltration into the groundwater.

**Lebanon**

As already discussed, renewable water resources per capita are already slightly below the scarcity threshold in Lebanon, with an expected decrease in the coming years. Lebanon is already using two-thirds of its available water resources, a high proportion by global standards (averaging 10 to 30 percent for other regions), and there is significant groundwater mining. There is a seasonal mismatch between supply (at its peak in the rainy winter) and demand (peaking in the hot, dry summer months). Factors exacerbating this seasonal water imbalance are the very low water storage capacity (6 percent of total resources, compared to the MENA average of 85 percent); the deficiency of water supply networks; and, on the demand side, rapidly rising demand from the municipal and industrial sectors. These seasonal imbalances are likely to lead to chronic water shortages. Already, dry-season shortages are emerging and water quality is deteriorating.
Current water demand varies, depending on the source of information, between 1,473 and 1,530 million m$^3$ per year, of which one-third is municipal demand, 61 percent is irrigation demand, and the remainder demand for industrial use. Per capita consumption accounts for up to 200 litres per day. These demand estimates are compatible with currently exploited resources. Surface water resources are largely exploited but with limited storage, while significant stress is put on groundwater mainly through private wells. Most private wells are unlicensed and therefore not monitored. In addition, a large share of water in public distribution systems is lost through system leakages. However, the annual picture of demand and supply masks how dire the situation has become during the dry period (the four months from July to October). Depending on which source is used, the deficit ranges from 220 to 388 million m$^3$. For potable water, the deficit between demand and supply has manifested itself in the rationing of supply. The situation is particularly acute in Beirut, Central and South Bekaa and Mount Lebanon, where water supply drops from 13 hours during the wet season to only 3 hours during the dry season.

It is difficult to estimate current levels of domestic water supply. Several sources indicate that the target capacity is 160 litres per capita per day. Actual delivery is presumably far lower, perhaps as low as 64 litres per capita per day in some areas, due to high system and distribution losses.
Irrigation is the biggest consumer of water (61 percent in 2010) with low efficiency, as the majority of networks still comprise open channels. Lebanon irrigates some 90,000 ha, of which more than two-thirds are subject to schemed irrigation (more than 100 ha parcels) and the rest small-scale irrigation. The main sources of irrigation water are the Litani River and the Litani–Awali complex of water resources. The share of water withdrawal for agriculture is likely to decrease over the coming years, as more water will have to be diverted for municipal and industrial purposes.

Table 16. Current and future water demand and the unmet demand gap under an average climate projection in Lebanon

<table>
<thead>
<tr>
<th></th>
<th>Demand (million m³)</th>
<th>Unmet (million m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanon</td>
<td>1,202</td>
<td>1,525</td>
</tr>
</tbody>
</table>

According to World Bank projections (2009), water demand will almost double over the 2010–2030 period, with demand exceeding supply in 2022. However, these figures do not account for the possibility of the optimisation of water re-use and effective improvements to water irrigation and distribution, etc.

Water quality is adversely affected by industrial, agricultural and domestic wastewater. The leaching of pesticides and fertilisers from agriculture causes groundwater and surface
water pollution. A wide range of chemical effluents are released into watercourses, especially surface water and coastal waters, as a result of industrial activities.

Similar to Jordan, over one million refugees have fled to Lebanon since the beginning of the Syrian crisis, resulting in a significant increase in pressure on the country’s already fractured and unreliable water networks. The increase in demand, coupled with recent extremely low rainfall, means Lebanon is heading towards a severe water shortage in the coming years.

Libya

The biggest user of water in Libya is the agricultural sector (83 percent), followed by domestic use (14 percent) and industrial use (3 percent). Large increases in water demand with very little recharge from precipitation have strained Libya’s groundwater resources, resulting in a decline in groundwater levels and quality, especially in Mediterranean coastal areas where most agricultural, domestic and industrial activities are concentrated.

![Figure 27. The structure of water consumption in Libya in 2006](image)

Agriculture has by far the highest consumption rate, at approximately 83 percent, while the domestic sector consumes about 14 percent. Industrial consumption, on the other hand, amounts to only about 3 percent of the total water extracted.
Figure 28. Groundwater availability, consumption and deficiency per basin in Libya in 2005

Table 17. Current and future water demand and the unmet demand gap under an average climate projection in Libya

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jefarah Plain</td>
<td>273</td>
<td>1,675</td>
<td>-1,402</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al Hamadah al Hamra</td>
<td>459</td>
<td>594</td>
<td>330</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al Jabal al Akhdar</td>
<td>4</td>
<td>288</td>
<td>575</td>
<td>1500</td>
<td>906</td>
<td>3,650</td>
</tr>
<tr>
<td>Murzuk</td>
<td>863</td>
<td>970</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al Sarir-Al Kufrah</td>
<td>455</td>
<td>1,382</td>
<td>3,650</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the Libyan General Water Authority (2006), available data on the water balance indicate that there is a major water supply deficit occurring in the Jaffara Plain Basin region, and a less significant deficit in the Jabal Al-Akhdar Basin region. These disparities have arisen due to population concentration and demand for arable land in the north-western and north-eastern regions of Libya. There is, however, no water deficit in the southern basins (Murzuk and Al Sarir Al Kufrah).
In summary, Libya faces extensive water-deficit problems at present, and these water resource shortages are anticipated to increase with Libyan water requirements growing rapidly. Recent reports suggest that Libya’s water deficit will exceed 4 billion m³ in 2025. Moreover, changing temperature and precipitation regimes cause changes in the water budget. Most of the coastal aquifers are already overexploited and may not continue to produce water at the same rate as they do now. As a result, irrigation and flood control systems, water storage, and hydroelectric installations, as well as production systems, will be seriously affected. The high evaporation rate, reaching up to 100 percent, is an additional challenge in terms of water resources in arid and semi-arid lands in Libya. A combination of saltwater intrusion due to sea level rise and increased soil salinity due to increased evaporation are expected to reduce the quality of shallow groundwater supply, while excessive demand is already contributing to saline intrusion problems in many parts in northern Libya. The water deficit has been aggravated by a water level decline and a deterioration in quality, especially around agricultural lands and urban areas where the excessive use of groundwater has resulted in seawater intrusion. As a result of sea level rise, some water supplies have become unusable due to the penetration of saltwater into coastal aquifers (Jefarah Plain, Sirt, Al Jabal AlAkhdar).

**Morocco**

Total internal renewable water resources in Morocco are estimated at 29 billion m³ per year. The hydraulic potential that can be economically and technically mobilised is estimated at 22 billion m³ per year, comprising 18 billion m³ of surface water and 4 billion m³ of groundwater, according to the secretary of state in charge of water and environment. This allowed the country to provide 95 percent of its urban population (18 million inhabitants) and 91 percent of its rural population (13 million inhabitants) with drinking water in 2010.

The surface waters mobilised at present are estimated at 10.75 billion m³ out of the 18 billion m³ that are exploitable, representing a mobilisation rate of 58 percent.
Underground water is mobilised at a rate of 67 percent (2.7 billion m³ mobilised out of 4 billion m³ of renewable water), although the actual mobilisation rate is 100 percent when taking into account overexploitation. Overall, the exploitation rate of water resources amounts to 67 percent (74 percent if we take into account the overexploitation of underground water).

Predicted water demand in all use sectors in Morocco is shown in Table 18.

Table 18. Current and future water demand and the unmet demand gap under an average climate projection in Morocco

<table>
<thead>
<tr>
<th>Demand (million m³)</th>
<th>Unmet (million m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morocco</td>
<td></td>
</tr>
<tr>
<td>2000–2009</td>
<td>15,739</td>
</tr>
<tr>
<td>2020–2030</td>
<td>19,357</td>
</tr>
<tr>
<td>2040–2050</td>
<td>24,223</td>
</tr>
<tr>
<td>2000–2009</td>
<td>2,092</td>
</tr>
<tr>
<td>2020–2030</td>
<td>9,110</td>
</tr>
<tr>
<td>2040–2050</td>
<td>15,414</td>
</tr>
</tbody>
</table>

Taking into account the projected demand for water, the national water balance is expected to become negative in 2030. Drinking and industrial water demand is evaluated at approximately 1 billion m³ for 2010. This demand will reach 1.6 billion m³ and 1.85 billion m³ by 2030 and 2050 respectively. In rural areas, drinking water demand was estimated at approximately 137 million m³ per year for 2010. It is set to reach around 400 million m³ by 2050. Regional differences in water balance are significant. Loukkos and Sebou basins are in surplus, mainly due to the delay recorded in equipping the agricultural area for irrigation. Other basins face a water deficit (Oum Er Rbia Basin by around 1,200 million m³; Moulouya by 273 million m³; Tensift by 273 million m³; Souss-Massa-Draa by 160 million m³; and Ziz-Guir-Rheris by 65 million m³).

Given this context, and in order to sustain the development of the country, Morocco has been actively involved in mastering water resources by building a consistent hydraulic infrastructure, comprising 130 large dams representing a capacity of almost 17 billion m³, as well as several thousand drillings and wells to capture groundwater. This infrastructure provides a solution to the temporal disparity in rainwater, secures drinking water supply for urban centres and ensures irrigation water for the irrigated perimeters. The total capacity of the dams has risen from 2.3 billion m³ in 1967 to around 16 billion m³ today.

Environmental pollutants released from domestic and industrial sources threaten surface waters and compromise downstream human use. Dissolved organic compounds and suspended solids are the most typical municipal water pollutants. The amounts of organic matter are rather high in urban wastewater, and the concentration decreases with the population increase due to the dilution effects. Nutrients and heavy metals are present in industrial wastewater. Municipal wastewater is also a source of biological contamination. Concentrations of faecal coliform and faecal streptococci bacteria also exceed WHO quality standards. Most of the problems are located in water basins affected by wastewater discharges — namely downstream of urban and industrial settlements and in coastal areas.

Groundwater quality is deteriorating: according to the Environmental Performance Review of Morocco (2014), 44 percent of groundwater samples in 2007 were degraded. Groundwater is contaminated with nitrates: over 10 percent of the main aquifers have a concentration above 50 mg/litre. High levels have been recorded in zones where the
pressure from agriculture and irrigation is very intense, as is the case in Tadla (Oum Er-Rbia) and Rmel (Loukkos). In the case of coastal aquifers, additional problems are caused by the risk of seawater intrusion and salinisation due to water overexploitation.

The urban population supplied with safe drinking water currently exceeds 18 million (nearly 94 percent are supplied by individual connections and 6 percent by standpipes). The rate of safe access to drinking water among the rural population was 92 percent in 2012 (up from 14 percent in 1994 and 61 percent in 2004). Forty percent of the rural population have an individual water supply connection. Despite the progress made in improving drinking water distribution, Morocco’s drinking water systems have low efficiency. Currently, the global connection rate to sanitation networks is around 70 percent in the urban area, which generates 700 million m³ of wastewater per year, of which 25 percent is treated (5 percent primary treatment, 12 percent secondary treatment and 8 percent tertiary treatment).

**Syria**

The demand for agricultural production is the principal factor underlying groundwater overexploitation, which is a vital challenge for water resources management in Syria. According to 2003 data, 80 percent of available water resources were used for the irrigation of approximately 1.3 million ha, spread throughout the country (Ministry of Agriculture and Agrarian Reform). However, the cultivated area represents less than 23 percent of total arable land (5.8 million ha), most of which is not irrigated. Groundwater extraction provides a reliable supply of water to farmers compared to government surface irrigation schemes. These areas are irrigated through boreholes, surface water and irrigation schemes developed by the government, and with river and spring waters.

![Figure 30. The structure of water consumption in Syria in 2003](image)

In 2003, domestic and industrial water use stood at about 6 percent and 3 percent respectively. Domestic water consumption ranges between 160 and 170 litres per capita per day (including water losses), depending on lifestyle, water availability and local circumstances. However, due to old networks and unqualified labour force, losses in the drinking water system are around 25 percent. While urban water demand was rapidly increasing before the conflict, due to a strong population growth rate and industrial
growth, new water sources are becoming scarce and extremely expensive to develop. Water deficits are expected to worsen, placing additional stress on all users. Since drinking water needs are given top priority in the government’s policy, water availability for agricultural use could face severe constraints. The primary objective of the national water policy has always been the provision of safe drinking water. Ninety-five percent of the population in urban areas and 80 percent of the population in rural areas have access to safe potable water. Urban and rural water supply and sanitation facilities have been enlarged and upgraded regularly to accommodate the expanding population. The water balance in most basins has been in deficit. This will be exacerbated in those basins encompassing large urban cities like Aleppo and Damascus, putting more pressure on water use for agriculture.

Reliable estimates concerning water availability and use were very hard to obtain before the conflict, and almost impossible now. Because water consumption, especially groundwater consumption, is partly illegal, it cannot be measured accurately.

Table 19. Current and future water demand and the unmet demand gap under an average climate projection in Syria

<table>
<thead>
<tr>
<th></th>
<th>Demand (million m$^3$)</th>
<th>Unmet (million m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15,311</td>
<td>17,836</td>
</tr>
</tbody>
</table>

The quality of surface water and groundwater in Syria is affected by human practices. The lack of domestic and industrial wastewater treatment plants and unsustainable agricultural practices have led to severe problems in terms of both water quantity and quality. Many cities have no wastewater treatment plants, and some farmers are using
wastewater to irrigate cultivated lands. Due to the deep groundwater table, cesspools are used in many rural areas in the southern part of Syria. Moreover, the use of treated wastewater in the Barada and Awai Basin has affected the quality of surface waters and groundwater by increasing nitrate concentrations.

Water shortages are exacerbated by poor water quality, particularly in areas with a high level of economic activity. Surface water and groundwater pollution by pathogens, nitrates, ammonia or heavy metals is evident in some water basins due to inappropriate wastewater collection and treatment, as well as the wide and often uncontrolled application of agricultural chemicals. This pollution hampers safe drinking water supply in both urban and rural areas. Furthermore, contaminated river water is heavily used for irrigation purposes, which poses a major health hazard to consumers of irrigated vegetables.

Wastewater treatment in Syria is undeveloped. Water pollution is caused by the discharging of untreated wastewater into water bodies or onto the ground. At present, only some urban areas are connected to a sewage treatment plant. Countrywide, there are about 20 treatment plants in operation, although the treatment processes do not always meet international standards and many wastewater pipes are leaking, thus contributing to environmental pollution. There is no sewage treatment at all in rural areas. Practically all treated wastewater is re-used in agriculture. The pollution of seawater is also a major issue. For example, four major population centres along the Syrian coast (Latakia, Tartous, Jableh and Banyas), discharge untreated sewage into the sea, along with a number of smaller municipalities as well as non-coastal towns, whose sewage reaches the sea through rivers ending in the sea. The severity of the municipal sewage problem is manifested by the drifting of raw sewage along the shoreline, and the eutrophication and bacteriological contamination of coastal seawater at the points of discharge of raw untreated sewage water. The problem becomes particularly acute during the summer season. Industrial pollution from the food processing, fertiliser and tanning industries contributes to the pollution load.

**Tunisia**

Since Tunisia gained independence in 1956, the rapid growth in water demand in the domestic, industrial and tourism sectors, and in the agricultural sector in particular, has prompted the national authorities to implement policies for the sustainable management and exploitation of water resources.

In the 2000–2009 period, annual total water demand was estimated at 2,472 million m³ and is expected to follow a continuous growth, following the socioeconomic development of the country. On the other hand, the total volume of available resources, comprising both non-conventional and freshwater supply, is rather low, and ranges between 4,000 and 4,800 million m³. The rate of exploitation of available resources is at present equal to 90 percent, and over 20 percent of irrigation equipment contributes to water saving in the agricultural sector. The re-use rate of treated wastewater is equal to 32 percent.
Table 20. Current and future water demand and the unmet demand gap under an average climate projection in Tunisia

<table>
<thead>
<tr>
<th></th>
<th>Demand (million m³)</th>
<th>Unmet (million m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunisia</td>
<td>2,472</td>
<td>3,295</td>
</tr>
</tbody>
</table>

The most important water use sector is irrigation, which uses 82\% of the country's available resources. However, only 6\% of agricultural land is irrigated, producing some 30\% of revenue from a range of products. The irrigated area is estimated at 420,000 ha, and irrigation demand is estimated at 2,120 million m³. Irrigation water supply originates from large dams, boreholes and wells, along with wastewater treatment. The lack of good-quality water is becoming increasingly acute in the wake of unpredictable climate patterns and the lower performance levels of the irrigated sector. The country therefore needs to find a way to maximise the value of the water allocated to the agricultural sector. Domestic water demand is at present estimated at 350 million m³ per year; industrial demand corresponds to approximately 120 million m³ per year; and tourism demand is estimated at 30 million m³ per year.

According to Tunisia's long-term water resources strategy, with projections to 2030 (EAU 21), the intensified use of groundwater from existing aquifers will become increasingly necessary. This will not only result in a decrease in groundwater levels, but will also endanger the quality of the water in areas that are already fragile, such as the coastal region. The deterioration was already noticeable by 2010 and will reach an anticipated 20\% degradation by 2030. The potential of surface water resources stored in large dams and reservoirs has been estimated to have reached maximum use in 2010, after which a continual degradation of resources towards 2030 will be the result of a build-up of silt and mud. To compensate for the losses, new works are already planned that should address some of the shortfall. In years with abundant rainfall, some of the necessary water reserves can be collected.

Efforts towards water resources mobilisation have prevailed in the development of the national master plans, along with the need to mitigate the socioeconomic impacts of the repeated droughts experienced in the last 15 years. In this regard, since 1990 Tunisia has been engaged in an ambitious programme for the exploitation and management of natural and non-conventional water resources. At the end of 2002, the main water sources comprised 27 large dams, 182 small dams, 650 artificial lakes, 3,176 boreholes, 130,000 wells and 93 natural water springs. Inter-basin transfer is performed among northern regions, towards the coast and from the western to the eastern part of the country. Transferred water is primarily used for domestic and irrigation purposes. The conveyance network for inter-basin transfer is approximately 30,000 km. Moreover, Tunisia has implemented a national water-saving strategy for irrigation, which includes the creation of user associations, pricing aimed at progressive cost recovery, targeted financial instruments for water-efficient farming equipment, and support to farmer revenues. Since 1996, this policy has stabilised irrigation water demand despite agricultural development, and the needs of both the tourism sector (a source of foreign currency) and cities (a source of social stability) have been assured (El Kharraz et al. 2012).
Water governance and government

The performance of the MENA water sector is currently progressing, but does not yet comply with internationally set targets. The ability of governance systems to live with the present dynamism and to master change is a crucial element in the attempt to speed up progress.

The governments of MENA countries are well aware of the urgency of reforming water policies. To that end, most of the analysed countries started to reorganise their water sector almost two decades ago (e.g. Lebanon, Morocco and Tunisia, and some achievements in Algeria can also be reported). However, water reforms face important difficulties when it comes to implementation. This can be explained by the limitations of some key actors and the more general governance challenges involved in achieving IWRM.

As climate change impacts will worsen the situation in the near future, water has emerged as a central issue in economic development and poverty reduction in the MENA region.

Power structures are also undergoing change in this transition. The growing emphasis on issues such as participation, stakeholder involvement, open information flows, decentralisation, a smaller role for the government, and a change from top-down management to strategic policy development are some indicators of this.

The strategic and regulatory framework

Algeria

The Algerian National Water Plan is being updated with targets to 2030. The National Water Plan aims at achieving development in the different segments of the national economy (industry, agriculture and tourism) based on the maximum mobilisation of conventional and non-conventional water resources. The implementation of the plan and its associated institutional reforms requires state financial support of about USD1.3 billion per year. By applying the revised National Water Plan and implementing the different policy instruments, it is expected to gradually bring the water resources sector to the implementation of the principles of IWRM. This will improve the performance of the water resources system through the involvement of users in decisions and the use of economic incentives, in addition to the implementation of flexible regulatory means. A national IWRM agency was established in July 2011 to assist decentralisation to the five existing hydrographical basin agencies, to which are attached consultation committees bringing together representatives of local institutional actors and associations.

Master Plans for Water Resources Development (PDARE) have been completed for the five main watersheds. A master plan for major hydraulic infrastructure for 2006–2025 was adopted in 2006.

One of the main pieces of water-related legislation is the 2005 Water Act, which has the goal of preserving and protecting water resources in the context of sustainable development. A normative framework thus exists for ensuring:
• the qualitative protection of water resources through standards for the discharge of water into water bodies and the creation of protective areas around drinking water supply infrastructure or vulnerable watercourses and water tables;

• the quantitative protection of water resources through the establishment of protective areas to limit the water drawn from depleted water tables, and the development and implementation of plans for combating water erosion in drainage basins upstream from reservoirs; and

• a financial contribution from water users through “user pays” and “polluter pays” fees that provide funding for water conservation and water quality projects.

**Egypt**

Currently Egypt has no officially approved water strategy. However, many studies have recently been conducted or are underway to propose a water strategy up to 2050. As of 2012, the ministry was in the process of elaborating a national strategy based on a policy paper, including several sub-strategies on topics such as tariffs, informal settlement and rural sanitation. Several papers have been written in recent years that are more prospective studies than real strategy papers. These studies have received financial support from many international donors, and some have even been initiated by them.

The National Water Resources Plan until 2017 was promulgated in 2005. This plan is used as a framework for sectoral plans and strategies in relation to, for example, water resources, water supply, wastewater treatment and re-use, agricultural development, local development and the protection of resources. The National Water Resources Plan describes how Egypt will safeguard its water resources in the future (until 2017 at this stage) with respect to both quantity and quality, and how it will use resources in the best way from a socioeconomic and environmental point of view. Three pillars define the policy: (i) measures to develop additional water resources; (ii) the better use of existing water resources; and (iii) the protection of public health and the environment. On the basis of these pillars, several programmes have been defined:

• the Nile Protection Programme;

• the Shore Protection Programme;

• the National Drainage Programme; and

• the Great Dams Rehabilitation Programme.

In the framework of the National Water Resources Plan, the Holding Company for Water and Wastewater has drawn up the Master Plan 2007–2037, or the Strategic National Water Plan 2037 (National Strategy for Water Supply and Sanitation). Two-thirds of the budget of this plan is dedicated to sanitation (EUR 20 billion). It comprises 23 regional master plans. The plan is to be implemented in two phases: a medium-term phase (2007–2012) and a long-term phase (2012–2037). Implementation is planned according to five-year master plans and annual action plans.

In addition, Egypt has developed the Sustainable Agricultural and Development Strategy up to 2030, which takes into account the re-use of treated wastewater.
Several other programmes, plans and projects are in progress or under preparation in the different ministries with sectoral objectives, including:

- a project for rural areas with a 2020 objective that is being implemented by water companies under the responsibility of the Ministry of Housing, Utilities and Urban Development (MHUUD), although the project has been delayed; and
- the preparation of anational water safety plan, based on the good quality and sustainabilityof water supply.

There is no single water law in Egypt. The Law on Irrigation (Law No. 12 of 1984) is the principal piece of legislation regulating the usage of water, water management and distribution. The law regulates:

- the definition of public water streams;
- requirements for using a water stream for irrigation and agriculture;
- the creation and usage of water banks;
- methods and requirements for distributing water;
- prohibitions on the use of sewage and underground water;
- methods to protect streams for the purposes of irrigation and navigation;
- sanctions against violators; and
- general provisions related to conflict resolution mechanisms between individuals using water resources and the Ministry of Water Resources and Irrigation.

Concerning water distribution and management, the law creates a private fund to finance the formation of new projects and the development of existing ones. Moreover, it gives the general director of irrigation the authority to ban the use of any stream or water resources in order to ensure the fair distribution of water to farmers.

Law No. 48 of 1982 regulates the quality of discharges into the Nile River and other waterways in order to control pollution.

Jordan

Water policies in Jordan have traditionally concentrated almost exclusively on what is perceived as the biggest problem: the balancing of scarce but relatively constant water resources and the ever-growing demand for water. Starting from the late 1990s, Jordan’s water and wastewater policy was guided by a set of policy papers prepared in 1997 and 1998. This included the Water Strategy for Jordan (1997), the Wastewater Management Policy (1998), the Water Utility Policy (1998), the Irrigation Water Policy (1998), and the Groundwater Management Policy (1998). These policies provided overall guidance on resource development and management, private sector participation and financing. In 2009, the Government of Jordan adopted a water strategy through 2022: “Water for Life. Jordan’s Water Strategy 2008–2022” to ensure drinking water supply, sustainable water management, fair and affordable costs, and adaptation to meet the economic development needs of a growing population. The strategy is a comprehensive set of guidelines employing a dual approach of demand management and supply
management. It places particular emphasis on the need for improved resource management, stressing the sustainability of present and future uses.

Jordan’s Water Strategy 2008–2022 envisages a number of reforms in the Jordanian water sector:

- an efficient and effective institutional reform;
- a drastic reduction in the exploitation of groundwater;
- the efficient use of water resources;
- the implementation of the Disi Water Conveyance and the Red–Dead Water Conveyance projects;
- the capping and regulation of irrigated agriculture in the highlands and the reinforcement of by-laws; and
- the introduction of appropriate water tariffs and incentives in order to promote water efficiency in irrigation and higher economic returns for irrigated agricultural products.

Special care is given to protecting the water supply against pollution, quality degradation and the depletion of resources. Furthermore, resource management will be improved by increasing the efficiency of conveyance and distribution systems, while the applications and uses of water will be more selectively determined. Multiple resources will be used interactively to maximise both the usable flow as well as the net benefit acquired from a unit of water. In conjunction with this, the strategy outlines the need to evaluate future industrial, commercial, tourism and agricultural projects in terms of their water requirements. The performance efficiency of water and wastewater systems will be monitored and rated, and improvements in performance will be introduced with due consideration given to resource economics. The strategy also aims to keep operations and maintenance costs to a minimum.

With respect to wastewater treatment, Jordan’s Water Strategy 2008–2022 sets the ambitious goal of providing adequate wastewater collection and treatment facilities for all major cities and small towns by 2022. In addition, all major industries and mines are to have treatment plants. In terms of wastewater re-use, the 2009 strategy has the goal that treated wastewater shall be fully re-used by 2022.

With Jordan’s Water Strategy 2008–2022 as an umbrella, a set of policy papers has been formulated and approved by the Council of Ministers. Government policies in the water sector are elaborated in four policy papers: the Water Utility Policy; the Irrigation Water Policy; the Groundwater Management Policy; and the Wastewater Management Policy. With the 2008–2022 strategy, these four policy papers and an investment programme, Jordan charted its “roadmap” for the future of its water sector. Responsibility for action planning was assigned to the Ministry of Water and Irrigation, which acted on project-level recommendations, but not on the policy recommendations. Due to the changes in government, and to financial obstacles, action planning was delayed then renewed in 2011, when the strategy was updated.

The current National Water Master Plan was developed in 2004. It consists of three main axes:
• a qualitative and quantitative description of water resources — surface and underground — and other resources;
• the forecasting of demand for water resources by all four consuming sectors; and
• proposed technical and operational measures to meet these demands and suggested alternatives and substitutes for the current diminishing resources.

The most recent policy document on water was published in 2014. The Ministry of Water and Irrigation developed the document “Establishing the Post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security — The Jordanian Perspective”, which reinforces the following strategic objectives in the water sector:

• the provision of safe, uninterrupted, reliable and affordable access to domestic water for all;
• the provision of an adequate quantity of water for economic activities, including industry;
• a greater understanding and the more effective management of groundwater and surface water;
• healthy aquatic ecosystems;
• the sustainable use of water resources;
• fair, affordable and cost-reflective water charges in place;
• measures implemented to mitigate the effects of increased population growth and economic development across all sectors that impact water resources and their users;
• preparation for, and adaptation to, challenges triggered by climate change;
• optimisation of the efficient use of water in irrigation; and
• increased wastewater system coverage kingdom wide.

Water sector policy makers recognise that domestic water supply is directly linked to national water security and is thus a national priority.

Until the establishment of the Ministry of Water and Irrigation in 1988, water legislation in Jordan was primarily based on the residual Ottoman Majalla code, complemented by a few other water laws. Since 1988, the legislative framework for the water sector has been rich (Laws 18/1988, 54/1992 and 30/2001, and By-law 85/2002 to name a few) and has provided the basis for institutional reform actions in order to define legal responsibilities in relation to water resources monitoring and planning. Additional laws on public health (54/2002); the control and use of groundwater (85/2002), including a revision of the groundwater by-law; as well as environmental protection (12/2003) complement the legislative structure.

Lebanon

The water sector in Lebanon has recently been strategically guided by the National Decennial Strategic Plan for the Water Sector (2000–2010). The main aim was to store winter water by building dams and artificial lakes. Drinking and irrigation water, as well as
wastewater and water quality problems, have also been taken into account. The main strategic objectives of this largely infrastructure oriented document included: (1) the development of additional water resources based on the construction of dams and the water recharge of aquifers; (2) potable water projects, based on rehabilitation and network development and the reduction of unaccounted-for water; (3) irrigation projects, rehabilitation and new development schemes; (4) wastewater projects: seweragepipes, wastewater treatment plants and sea outfalls; and (5) a project for the alignment and rectification of rivers for flood mitigation.

The National Water Master Plan, which corresponds to an IWRM plan, was prepared in 2004 by the Ministry of Water and Irrigation. The master plan addresses in a holistic manner all key challenges facing the water sector, including resource and demand management, socioeconomic and environmental considerations, as well as transboundary deliberations. The most recent development in the field of policies and plans concerns the preparation and operationalisation of the National Water Sector Strategy (NWSS) until 2022 (approved by the Council of Ministers in March 2012). During the preparation of this strategy, three separate documents were issued:

- a baseline that provides a general overview of the water sector (September 2010);
- baseline supply/demand forecasts that present projections of how planned resource augmentation and other projects will meet future demand as estimated by the authors of the NWSS (November 2010); and
- a baseline for a sector-enabling environment and a 2011–2015 investment plan (December 2010).

The investment plan for 2011–2015 was based on the following initiatives:

a) Institutional and organisational initiatives. This pillar’s main thrust is the completion of the institutional reforms defined under Law 221/2000.

b) Financial and commercial initiatives. This pillar aims at improving the financial performance of the sector by setting more rational tariffs, facilitating private-sector participation in the sector and improving institutional performance.

c) Legal and regulatory initiatives. This pillar aims at enacting the draft Water Code and providing the legal framework for NWSS initiatives.

d) Environmental concerns. This pillar will mainstream environmental concerns into the water sector, including: the protection of water resources and recharge zones, flood mitigation, and the institutionalisation of strategic environmental assessment in the planning cycle.

e) Investment Plan 2011–2015. Capital investment of USD 5,086 million, distributed as follows: USD 1,134 million for resource augmentation; USD 1,394 million for water supply networks; USD 343 million for irrigation; USD 2,160 million for wastewater systems; and USD 55 million for enabling initiatives. Operation and maintenance investment of USD 732 million distributed as follows: USD 552 million for water supply; USD 104 million for irrigation; and USD 77 million for wastewater.

In terms of water legislation, Lebanon carried out a revision of the legal framework in 2000 to reflect the new vision for water resources management following the
requirements of an IWRM approach. The framework was adopted in 2005 and resulted in amended water legislation and new institutional settings. Law No. 221 of 2000 on the Management of the Water Sector\(^\text{38}\) (the Water Code) and its amendments form the principle piece of legislation regulating the water sector in Lebanon. By issuing this law, the Lebanese Government aimed to foster institutional change and to assign responsibilities to parties governing the water sector (mainly the Ministry of Energy and Water, and water and wastewater utilities). However, the law was not based on a profound assessment that considered the current political, legal, socioeconomic and environmental situation in Lebanon. This resulted in the frequent modification of many laws, decrees and decisions, which are often contradictory, and the generation of conflicting rather than complementary roles among institutions. In addition, the water sector is partially governed by Law No. 444 of 2002 on the Protection of the Environment, which strengthened the role of the Ministry of Environment (MOE) in promoting the sustainable use of natural resources, preventing environmental pollution and degradation, and ensuring public safety within the framework of a stable environment. However, the lack of enforcement decrees and mechanisms for this law results in its ineffective implementation. Such weaknesses are behind the non-implementation of many laws, decrees and regulations. The lack of financial, human and technological resources aggravates the situation.

**Libya**

Libya’s National Strategy for Water Resources Management 2000–2025 (1999) sets the general platform for the national water policy. The legal framework includes an obligation to elaborate an IWRM action plan/strategy, but to date there has been no adequate progress.

Law No. 3–1982 on regulating water sources, issued on January 5, 1982, is the main legislation governing the issue of water usage for agricultural and drinking purposes. The law sets out the general principles for regulating the utilisation of water resources and defines and controls preservation and protection operations. Article 5 of the law grants Libyan citizens the right to use water resources as long as they do not damage those resources.

**Morocco**

Despite a difficult environment, Morocco has continuously taken various initiatives in order to manage its scarce water resources through appropriate models (e.g. the control and mobilisation of water resources through the construction of big reservoirs, dams and works for water transfer; the development of technical skills and applied scientific research; and long-term planning since the 1980s). Water policy was recently given new impetus with the adoption of a new water strategy. Since the adoption of its National Development Strategy for the Water Sector (*Stratégie Nationale du Secteur de l’Eau*) in

\(^{38}\) Collaboration with the World Bank for an institutional reorganisation in the water sector in Lebanon resulted in the development of a new water law — Law 221 of May 29, 2000. This meant the reorganisation of the entire water governance and water sector.
2009, Morocco has been clearly committed to a policy of IWRM implementation in six areas:

- the management of water demand and water efficiency;
- the management and development of offer;
- the preservation and protection of water resources;
- the reduction of vulnerability to natural hazards;
- the continuation of institutional and regulatory reforms; and
- the modernisation of information and capacity-building systems.

The strategy is based on three levers:

- Far more ambitious objectives in order to consistently meet the country’s water needs, but also to ensure continuous and sustainable protection against the effects of climate change.
- A dramatic shift in resource use and management behaviour through coordinated supply and demand management, covering:
  - the perpetuation of protection measures and the reconstitution of underground stocks and lake areas;
  - the rationalisation of water demand;
  - the generalisation of wastewater treatment and re-use in cities;
  - an innovating portfolio of mobilisation solutions and resource access, combining all the relevant local solutions with better interconnection between regions; and
  - proactive protection measures (of the environment, and against floods).
- The real long-term management of water through:
  - regularly updated, readily available data (at the national level) regarding needs and availabilities in the long term;
  - political commitment and efforts on the part of all stakeholders, supported by an adequate regulatory framework and governorship; and
  - more ambitious public and private funding.

In 2010, the implementation of the National Water Strategy was initiated through the establishment of a project management office, including 10 working groups, to conduct and monitor the implementation of strategy-related programmes year by year in close collaboration with all relevant stakeholders.

Intervention policies and the implementation of the National Development Strategy for the Water Sector are being realised through large-scale projects and plans with 3-, 5-, 15-, 20- or 25-year objectives, broken down into annual action plans. The National Plan for the National Development Strategy of the Water Sector (National Water Plan, or PNE), which has a 2030 perspective, is being validated. These programmes include large-scale projects.
Some of the programmes are available in five-year plans. The major programmes are outlined below:

- **The National Programme for Sanitation and Wastewater Treatment (PNA)** has been implemented since 2006, providing, among other things, for actions aimed at reaching 300 wastewater treatment plants by 2025; connecting 75 percent of the urban population to sanitation networks in 2016, 80 percent in 2020 and 100 percent in 2030; reaching a volume of 50 percent of wastewater treated in 2016, 60 percent in 2020 and 100 percent in 2030; having tertiary treatment and re-use of wastewater at 100 percent in 2030; and reducing pollution by 60 percent by 2020. By 2013, the PNA had increased the rate of connection to sewerage systems to 72 percent (compared to 70 percent in 2005). It has also increased the volume of treated wastewater to 272 million m$^3$ per year, which corresponds to 36.13 percent of total wastewater (compared to just 8 percent in 2005). Of this 36.13 percent, 21 percent receives tertiary treatment.

- **The National Municipal Solid Waste Management Programme (PNDM)**, which has a 15-year horizon. Among the key objectives are the achievement of a collection rate of 85 percent by 2016, 90 percent by 2020, and 100 percent by 2030; and the operation of sanitary landfills covering all urban centres (100 percent) by 2020. At the same time, the PNDM aims to rehabilitate or close all non-sanitary landfills by 2020.

- **The “Green Morocco” project (Maroc Vert)** has objectives that span through to the year 2020 and involves a significant component for irrigation and water conservation. It aims to increase the efficiency of agricultural water use through upgraded irrigation infrastructure and best practices, but also by increasing the proportion of low-water-demand crops. In addition, water losses in irrigated areas, the cropping of marginal lands and the growing of non-resilient crops (e.g. growing wheat instead of the traditional barley) would be avoided. To support the plan, the Ministry of Agriculture and Maritime Fisheries launched the National Programme for Saving Irrigation Water (PNEEI), which is aimed at upgrading public irrigation networks and adapting them for localised irrigation and on-farm drip irrigation (on 550,000 ha during a 10-year period), as well as introducing the appropriate equipment in reservoirs located in agricultural areas (i.e. in the Sebou watershed). Irrigation projects at Gharb (Kenitra), Haouz (Marrakech) and Souss-Massa (Agadir) were initiated in 2012 with the support of the European Investment Bank.

- **Master plans for IWRM (PDAIRE)**, prepared by each river basin agency (ABH) for its respective basin, have a long-term vision and are subject to five-yearly review. The PDAIRE integrates the national plan and various other plans and programme objectives.

- **Communal development plans**, resulting from the obligation on each municipality to develop such plans every three years, in particular with respect to investments in water supply and sanitation.

The PDAIRE at river basin level, and the National Water Plan (PNE), are established for a period of 20 years based on the principles of decentralised and concerted integrated water resources management. They are approved by decree, after consultation with the
Higher Council for Water and Climate and may be reviewed every five years. These programmes — especially when it comes to investment — benefit from the support of international donors (e.g. the European Union, KfW, the French Development Agency and the World Bank).

The entire water sector in Morocco is governed by Law 10-95 of September 1995, commonly referred to as the Water Act (currently under revision), which provides the framework for managing and creating the necessary tools for its implementation. The Water Act was introduced with the aim of addressing the challenges facing the country — increasing water scarcity, significant demand pressures, rising water supply and treatment costs, and the deterioration in the quality of water and the environment. It encompasses the regulation of drinking water, the improvement of agricultural water uses, wastewater treatment and re-use, and water security against illegal pollution.

The main principles of the Water Law in Morocco include the uniqueness and public character of water resources; recognition of the economic value of water, including the “user pays” and “polluter pays” principles; national and regional solidarity in water management; and a certain level of decentralisation. The law stipulates that water management issues must be discussed at all levels (national, regional and local) between authorities, decision makers, users and elected representatives. Two major arrangements aim at permitting the initiation, and eventually the establishment, of dialogue on water management:

- the affirmation of the role of the High Council of Water and Climate, which is the forum that allows all national actors concerned in water issues to discuss national policy and the main policy directions in water resources management; and
- the establishment of river basin agencies\(^{39}\) that will permit a real decentralisation in water management, implying that all parties concerned are involved in decision making.

The 1995 Water Law marked a first tentative paradigm shift from the supply side to demand-side management, with the aim of integrating these two perspectives. A strong emphasis was given to water use efficiency, resource allocation and the protection of water quality, recognising water as an economic and social good. The law also established legal and regulatory instruments for the protection of water resources and hydraulic public domain. It provides standards for water quality, quality objectives, the inventory level of pollution permits for the discharge of wastewater, protection zones around water catchment points, and the re-use of treated wastewater. Since 2005, Law No. 10-95 has been supplemented by two decrees: Decree 2-04-553 of 2005 on spills, discharges, and direct or indirect deposits into surface water or groundwater; and Decree No. 2-05-1533 of 2006 on on-site sanitation. This latter decree aims to improve living conditions in communities with dispersed housing, and to protect water resources.

The Water Law focused primarily on decentralising water management operations and introduced the integrated management and rationalisation of water use in order to meet the needs of all users concerned. It defines the geographical setting for the management of water resources as the river basin, which is the unit for the development and

\(^{39}\) Sometimes also referred as hydraulic basin agencies.
implementation of local integrated water management plans — which, in turn, contribute to the development of the National Water Plan.

_Syria_

Syria’s 2003 Water Strategy, which followed a water sector analysis in 2000, was prepared by the Ministry for Irrigation. Although the Water Strategy entails provision for elaborating an IWRM plan, this has not yet been translated into any concrete action.

_Tunisia_

Tunisia’s water policy aims to contribute to progressive and sustainable socioeconomic development, while balancing two conflicting phenomena: (i) limited water supplies and the increasing cost of generating or storing and transferring additional resources; and (ii) growing demand for water. In accordance with the Tunisian Constitution, water resources management is the responsibility of the national government, with the participation of local _gouverneurs_. The Development Strategy of the New Tunisia stresses the need to optimise the use of available natural resources through:

- the mobilisation and optimum utilisation of available water resources and concentration on the process of using non-traditional resources — namely, the desalination of seawater and water treatment;
- further rationalization of water use in agriculture; and
- the fight against desertification through the use of available groundwater and the creation of new irrigated areas and oases, and the preservation of ecological systems and biodiversity.

Regional water planning schemes have been developed in Tunisia for each natural/hydrological region (far north, north, south and centre) since the 1970s, creating the basis for the national water policy and defining mobilisation and transfer programmes to satisfy the needs of all sectors, with priority given to drinking water. Starting from the 1990s, and taking advantage of the mobilisation achievements, several sectoral and sub-sectoral strategies attempting a more integrated approach and aimed at the optimisation of water resources use have been developed:

- The National Strategy for Irrigation Water Conservation (Plan Stratégique pour le Développement de l’Economie de l’Eau en Irrigation) (1996), which aimed to rationalise the use of water in all sectors, and in particular reserves for drinking water and irrigation, to ensure that the maximum economic value is derived from irrigation and to keep water demand at a level compatible with available resources, which are considered insufficient to guarantee sustainability.
- EAU 21, or the Long-Term Water Strategy for the 2030 Horizon (1998).
• The National Strategy for Agriculture and Ecosystems Adaptation to Climate Change (2007).

The main priority of the Decennial Water Resources Mobilisation Strategy was to increase supply. The construction of more than 200 small and large dams and the drilling of more than 1,000 deep groundwater wells have led to improvements in the use of Tunisia’s available water resources from 60 percent in 1990 to 87.5 percent in 2004. The total budget for the strategy was USD 1.7 billion. The USD 2 billion Complementary Strategy until 2011 aimed to realise long-term objectives, in particular the sustainable balance of demand and available water resources. It partly comprised similar measures to those in the mobilisation strategy, with the aim of reaching a mobilization rate of 95 percent.

Finally, EAU 21 builds mainly on the water master plans for the north, centre and south of Tunisia. The strategy consists of a large number of studies and research programmes with the target of planning and managing water resources more efficiently in the long term. The USD 1.3 billion strategy was introduced in early 2014, setting up a comprehensive infrastructure investment programme conceived by the Tunisian water utility SONEDE. Half the funding is still missing.

Table 21. Strategic infrastructure measures from the Tunisian Water Sector Strategy until 2030

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost (USD million)</th>
<th>Funding status (2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthening of the water transfer system in the north</td>
<td>122</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Saida dam</td>
<td>70</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Raw water transfer system from Saida to El Khouine</td>
<td>52</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Strengthening storage and treatment capacity in the Sahel region and Sfax</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Kelaa Kebira reservoir</td>
<td>65.5</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Networks and storage in Belli complex</td>
<td>22</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Sahel WTP and related infrastructure</td>
<td>40</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Rehabilitation in Belli resort</td>
<td>2.5</td>
<td>World Bank</td>
</tr>
<tr>
<td>Strengthening water production capacity in Greater Tunis</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Extension and rehabilitation of Ghdar el Goulla treatment complex</td>
<td>14.5</td>
<td>World Bank</td>
</tr>
<tr>
<td>New Bejaoua WTP and related complex</td>
<td>92.5</td>
<td>Looking for financing</td>
</tr>
<tr>
<td>Water transfer systems for rural areas in the north and north-west</td>
<td>254</td>
<td>33 percent funded (KfW, JICA, Gov)</td>
</tr>
<tr>
<td>Rehabilitation and strengthening of urban infrastructure</td>
<td>197</td>
<td>66 percent funded (AFD, JICA, KfW)</td>
</tr>
<tr>
<td>Construction of 16 brackish water reverse osmosis (BWRO) plants</td>
<td>130</td>
<td>KfW</td>
</tr>
<tr>
<td>Construction of 4 seawater reverse osmosis (SWRO) plants</td>
<td>359</td>
<td>95 percent funded (KfW, AFD, JICA)</td>
</tr>
<tr>
<td>Total</td>
<td>1,300</td>
<td>54 percent funded</td>
</tr>
</tbody>
</table>
These documents demonstrate solid experience in the definition of water policies and the preparation of planning strategies. However, their multiplicity may signify limited ownership on behalf of the authorities and entail the potential for repetition and the duplication of efforts. With the aim of addressing the water sector in a holistic manner, the Tunisian Government is currently preparing a national water strategy with a time horizon until 2050. The strategy will represent a comprehensive effort and the aim is to ensure a wide consultation process in its elaboration.
Table 22. Overview of the institutional framework for water management in the MENA countries covered by the present study

<table>
<thead>
<tr>
<th>Country</th>
<th>Legislation</th>
<th>Main administration for IWRM</th>
<th>Institutions in charge of:</th>
<th>Inter-sectoral coordination</th>
<th>Territorial water management</th>
<th>Water master plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>No single water law (two main laws)</td>
<td>Ministry of Water Resources and Irrigation (MWRI)</td>
<td>Ministry of Housing, Utilities and Urban Development (MUHUD)</td>
<td>MHUUD</td>
<td>MWRI</td>
<td>Cabinet Council (national)</td>
</tr>
<tr>
<td>Jordan</td>
<td>No single water law</td>
<td>Ministry of Water and Irrigation (MWI)</td>
<td>Water Authority of Jordan (WAI)</td>
<td>WAI</td>
<td>Jordan Valley Authority (JVA)</td>
<td>MWI</td>
</tr>
<tr>
<td>Tunisia</td>
<td>Single water law (1975, 2001)</td>
<td>Ministry of Agriculture and Hydraulic Resources (MARH); Ministry of Environment and Sustainable Development (MEDD)</td>
<td>National water utility company (SONEDE)</td>
<td>National Sanitation Office (ONAS)</td>
<td>MARH</td>
<td>MARH (national)</td>
</tr>
</tbody>
</table>

Sources: SEMIDE – EMWIS database: data for 2008; other resources;
Institutional framework

Algeria

The Ministry of Water Resources (MRE), created in 2000, is the government department in charge of water resources. Before 2000, water management operations were divided between several ministries, the names of which regularly changed (e.g. State Department of Hydraulics; Ministry of Hydraulics, Territorial Development and Environment; Ministry of Infrastructure). The MRE is responsible for water resources planning and for investments in all areas relevant to water resources protection and exploitation, such as hydraulic infrastructure, inter-basin transfers, drinking water supply networks, and sewage treatment plants. It is also responsible for allocating available water among the different uses (agricultural, domestic and industrial), and for controlling all water-related infrastructure (public and private). Additional tasks include the monitoring of water resources, in terms of both quality and quantity.

The MRE has control over the following specialised national agencies dealing with specific water-related tasks:

- The National Dam and Inter-basin Transfer Agency (Agence Nationale des Barrages et des Transferts, ANBT).
- The National Agency for Water Resources (Agence Nationale des Ressources Hydrauliques, ANRH), which is responsible for mapping, monitoring, producing and storing information on water resources, including the national water resources inventory, quantitative and qualitative assessments of water resources, and compiling data and tools for the planning, development, management and preservation of water resources.
- The National Office for Irrigation and Drainage (Office National de l’Irrigation et du Drainage, ONID), which is responsible for the management of infrastructure and groundwater resources for irrigation.
- The National Sanitation Office (Office National d’Assainissement, ONA).

The MRE also controls the Algerian National Water Company (L’Algérienne Des Eaux, ADE), a state-owned company responsible for drinking water distribution and sanitation. Eighty percent of water distribution systems in Algeria are under the responsibility of the ADE, while most sewerage systems are under the responsibility of the ONA. Both entities were created in 2001 and currently operate under the supervision of the MRE that was established a year earlier. The ADE is responsible not only for providing water services, but also for promoting water conservation and increasing public awareness. The company operates extensive water transmission systems that transfer water over long distances, often covering several provinces. The ADE has branches (unités) in each of the country’s 48 provinces. In the six provinces containing the largest cities in Algeria, four subsidiaries of the ADE and ONA provide water and sanitation services — notably in Algiers and Tipaza (SEEAL), Constantine (SEACO), Oran (SEOR), and Annaba and El Tarf (SEATA). In other parts of its service area, the ADE provides water services directly through 15 “zones”, each comprising two to four provinces. The private sector operates the water supply and
sanitation systems of three large cities — Algiers, Oran and Constantine — under management contracts with the ADE and ONA.

In addition to the centralised responsibilities for water that lie with the MRE, in 1996 local water management was devolved to five river basin agencies (*Agences de Bassins Hidrographiques*, ABH) following an amendment to the 1983 water law (Oran–Chott–Chergui; Algiers–Hodna–Soumman; Constantinois–Mellégue–Seybousse; Cheliff–Zahrez; and Sahara). As devolved agencies of the MRE, these ABHs translate into practice the principle of the joint and integrated management of water resources throughout the watershed (developing and updating cadastre hydraulics and the hydrological balance of the watershed; and collecting data, documents and information on water resources, levies and water consumption).

At the local level, the MRE has devolved certain responsibilities to the provincial water directorates (DHWs) — state agencies constituting water administration at the level of the 48 provinces (*wilaya*) of the country. DHWs manage 260 territorial subdivisions. The responsibilities of the DHWs include participating in inventories and studies and updating the databases of aquifers in the respective province; supervising and managing drilling operations; issuing drilling permits; and collecting information.

Table 23. Water resources planning matrix in Algeria

<table>
<thead>
<tr>
<th>Activity</th>
<th>MRE</th>
<th>ANB</th>
<th>ANRH</th>
<th>ADE</th>
<th>ONA</th>
<th>ONID</th>
<th>ABH</th>
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<tbody>
<tr>
<td><strong>Surface waters</strong></td>
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<td>Use</td>
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<tr>
<td>Storage</td>
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<tr>
<td>Groundwater recharge</td>
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<tr>
<td>Quality monitoring</td>
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<tr>
<td>Assessment</td>
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<td><strong>Groundwater</strong></td>
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<td>Use</td>
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<td>Recharge</td>
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<td>Quality monitoring</td>
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<td>Assessment</td>
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<td>Well permits</td>
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<td><strong>Irrigation networks</strong></td>
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<td>Rehabilitation</td>
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<td>Modernisation</td>
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<td><strong>Re-use</strong></td>
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<td>Drainage water</td>
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<td>Wastewater</td>
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<td><strong>Desalination</strong></td>
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<td>Introduction of technology</td>
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<td><strong>Efficient water use</strong></td>
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<td>Domestic</td>
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<tr>
<td>Industrial</td>
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</table>

40 Sometimes also referred to as *wilaya* hydraulic departments.
In terms of water-related legislation, the principal law in Algeria is Water Law No. 05-12 of 2005, which introduced significant reforms in Algerian water management compared to the older legislation. Structural reform has involved the decentralisation of water resources management and the establishment of an autonomous irrigation agency. Regulatory reform has focused on water pricing with the goal of cost recovery. The main focus is on the introduction of the general principles of environmental sustainability, and the provision of new tools in water resources planning through the development of regional water management plans, to be elaborated at the hydrographical basin level. The 2005 Water Law also introduces the participation of stakeholders, policy makers and decision makers in all water-related decisions.

Overall, continuous updating ensures that water-related legislation meets emerging needs and concepts and addresses the increased concern over the environmentally sustainable management of water resources. However, law enforcement, especially with regard to water abstraction and pollution control, can possibly be considered insufficient.

The 2005 Water Law introduced the concept of stakeholder participation in all water-related decisions, including the representation of different user categories in the management of irrigation schemes. It served as an umbrella for the development of water user associations (WUAs). However, the law did not clearly state the legal status of WUAs, but it was later flexibly appropriated to form WUAs. The main purpose of these WUAs was to support the management, use and protection of water resources within their area of responsibility. Since 2006, a monitoring committee in each large-scale system has promoted participatory irrigation management. In small-scale systems, the state currently imposes the formation of a WUA before any state intervention on the hydraulic infrastructure can take place. However, the active participation of WUAs in water management remains at an embryonic stage (Ghazouani et al. 2012). A sense of participation is not yet developed and the associations are still lacking institutional and legal arrangements for their involvement and the devolution of their responsibilities, as well as the proper technical and financial autonomy to regulate their functions for the proper management and maintenance of the schemes.
Egypt

The Egyptian Government passed a strategy of water management based on demand management and IWRM. However, water management remains highly centralised, with no real involvement on the part of users (“top-down” management), and on a very sectoral basis. Water management is extensively branched but still highly centralised. Responsibilities— for planning, design, construction, operation, research, monitoring and regulation—are carried out through multiple agencies and departments within these agencies, and each is funded through a parallel budget line. These agencies have the nature of “budget-maximising” bureaucracies and have very little incentive to be accountable to service users.

Water management falls under the responsibility of several ministries, the most important being the Ministry of Water Resources and Irrigation (MWRI); the Ministry of Agriculture and Land Reclamation (MALR); the Ministry of Housing, Utilities and Urban Development (MHUUD); and the Ministry of Environment (MoEE)\(^\text{41}\). Other ministries with a role in water policy formulation and secondary water management operations are the Ministry of Health and Population (MoHP), and the Ministry of Local Development (MoLD).

The MWRI is the main governmental body governing the issue of water management and usage. In addition to the minister’s office and the administrative support staff, the primary units and agencies include:

- The Water Sector (MWRI WS), which is responsible for the distribution of surface water among different users.
- The Planning Sector (MWRI PS), which is responsible for providing technical advice to policy makers, preparing the national water resources plans, and planning investments in water resources development.
- The Nile River Sector (MWRI NRS), which is responsible for keeping track of the water resources of the Upper Nile, overseeing the execution of the treaty with Sudan over Nile water, and planning works on the Upper Nile.
- The Irrigation Department (MWRI ID), which is responsible for the construction, operation and maintenance of the system for the distribution of water; the regulation of the use of groundwater; and the construction, operation and maintenance of the barrages and reservoirs that control the Nile River below the Aswan High Dam.
- The Mechanical and Electrical Department (MWRI MED), which is responsible for installing and operating pumping stations for irrigation and drainage purposes.
- The Drainage Authority (MWRI DA), which is responsible for establishing, operating and maintaining tile and surface drainage systems.
- The Shore Protection Authority (MWRI SPA), which is responsible for protecting the seacoast.

\(^\text{41}\) Sometimes also referred to as the Ministry of State for Environmental Affairs.
• The Survey Authority (MWRI SA), which is responsible for surveying and mapping the lands of Egypt.

Other public authorities directly related to the MWRI are:

• The National Water Research Centre (NWRC), the research arm of the MWRI, is a well-developed and established research base carrying out applied research and water monitoring responsibilities. It acts as a scientific body for all aspects of water resources management. On a regional scale, the NWRC acts as the coordinating unit for the African Water Resources Network and is a member of other water resources networks in Europe and other countries. In view of the scarcity of water resources, the NWRC has taken the lead in setting a general framework for future cooperation between Arab countries. It consists of 12 research institutes, the Central Laboratory for Environment Quality Monitoring (CLEQM), and the Strategic Research Unit (SRU).

• The Egyptian Public Authority for Drainage Projects (EPADP) is in charge of all drainage activities within the MWRI and has representative directorates within the entire Nile network. The EPADP is responsible for the construction and maintenance of closed and open drains.

• The Egyptian National Committee on Irrigation and Drainage (ENCID) is a semi-governmental entity. Its 30 members are senior governmental engineers and professors from engineering universities and research centres.

• The High Dam Authority, which is responsible for operating and maintaining the Aswan High Dam and Lake Nasser.

The MWRI has the long-term goal of realising its internal functions and operations through a process of local consolidation and ministry-wide decentralisation, including the devolution of authority to the local level. New mandates for the ministry will be to enhance participatory irrigation management; stakeholder engagement and public participation; the integration of environmental considerations into water resources planning and management; coordination approaches between institutions utilising modern information technology; and market-based instruments for improved water use efficiency and water quality management.

The Ministry of Agriculture and Land Reclamation (MALR) is involved in improving agricultural activities and land reclamation, including water management at the on-farm level. The MALR is in charge of agricultural research and extension, land reclamation, and agricultural, fisheries and animal stock development.

The Ministry of Housing, Utilities and Urban Development (MHUUD) is responsible for the provision of water supply and sanitation services to the municipal and industrial subsectors. Under the MHUUD, the Executive Organisation for Potable Water and Sanitary Drainage Projects (NOPWASD) and its affiliated agencies are responsible for planning, designing and supervising the construction of municipal drinking water treatment plants, distribution systems, sewage collection systems, and municipal

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42 Sometimes also referred to as the Ministry of Housing, Public Utilities and New Urban Societies.
wastewater treatment plants. The Egyptian Water Regulatory Agency (EWRA), established in 2006, is in charge of the economic and technical regulation of utilities.

The Holding Company for Potable Water and Sanitary Drainage (HCWW), founded by a decree in 2004, and its 26 affiliated companies are in charge of the operation and maintenance of water and sanitation infrastructure. It owns all water and sanitation infrastructure in Egypt and is responsible for financial and technical sustainability to the governorate-based utilities. Its affiliated companies include the General Organisation for Greater Cairo Water Supply, the Cairo General Organisation for Sewerage and Drainage, the Alexandria Water Company, the Alexandria Sewerage and Drainage Company, and 22 affiliated companies, each covering one or more of Egypt’s 29 governorates and in charge of both water supply and sewerage. The companies that cover several governorates include one for the canal governorates (Suez, Port Said and Ismailia), and one for Sinai (North and South Sinai governorates).

The government’s support for private-sector participation in water supply and sanitation is focused on build-operate-transfer financing for wastewater treatment plants, through which private finance is mobilised. This approach is limited to Cairo and Alexandria, where external donors have become less keen to provide assistance.

In addition, Egypt has developed a number of public scientific organisations dealing with water issues (the Water Management Research Institute, the Water Resources Research Institute, the Nile Research Institute, the Hydraulic Research Institute, the Construction Research Institute, the Canal Maintenance Research Institute, the Coastal Research Institute, the Groundwater Research Institute, the Drainage Research Institute, etc.). More or less all these scientific and academic organisations are attached or affiliated to the NWRC.

An institutional reform process is currently underway in the Egyptian water sector, with the goal of establishing a decentralised system that would allow the MWRI to deliver better services more cost effectively, and that would create incentives for users to utilise water more efficiently. The decentralisation of water management tasks should eventually limit the direct responsibility of the MWRI to water allocation at the level of major canals, and to the design and enforcement of national policies and regulations. Accordingly, WUAs, which are sometimes referred to as water boards in the Egyptian context) at local and branch canal levels will be in charge of local water distribution, the operation and management of infrastructure, as well as cost recovery. In fact, the integration of different government services at the local level is another concern that is seriously addressed in the institutional reform.
Table 24. Water resources planning matrix in Egypt

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The creation of WUAs in Egypt was made operational at the improved *mesqa* (branch canal) level from 1988. In 1992, the Irrigation Advisory Service (IAS) was initiated within the Ministry of Public Works and Irrigation (MPWI) to work with WUAs. These associations did not have legal status until 1994, when Law 12 of 1984 on Irrigation and Drainage was amended by Law 213 of 1994 to allow for the establishment of WUAs in the new lands and in the improved irrigation project area in the old lands at the *mesqa* level. This policy of the MWRI is seen as a step on the road towards the decentralisation of the management of irrigation and drainage systems. This new law could therefore be considered as a sign of a new era and as the legal base for institutionalising the regrouping of irrigation water users to restore the group management of irrigation water at the *mesqa* level, but under new technical and modernised conditions. However, others consider it as an indirect way to extend the control of formal irrigation management to that lower level, which was previously a fully private affair. The most recent policy of the MWRI has adopted the expansion of forming WUAs at the district level, which is higher than the branch canal level within the context of the newly adopted IWRM approach. At present, there are about 6,000 WUAs at the *mesqa* level, serving about 120,000 ha, and fewer than 90 water boards at the branch canal level in the same areas. These steps are still in the piloting/evaluation stage, with the support of several foreign aid projects.

Intervention policies and their implementation are being realised through several plans and programmes, including strategies for the middle and long term. Egypt receives extensive financial support from international donors (e.g. the EU, the Asian Development Bank (ADB), the European Investment Bank (EIB), the French Development Agency (AFD), the German development bank KfW, Japan International Cooperation Agency (JICA) and the World Bank) for investments, capacity building and studies through various programmes (e.g. the Water Sector Reform Programme, Phases 1 and 2 (2011–2015) — the EU and Dutch Development Cooperation; Improved Water and Wastewater Services Programme (IWSP), Phase 1 Lower Egypt (2008–2014) and Phase 2 Upper Egypt (2011–2017) — KfW, EU, EIB, AFD; and the GIZ Water and Wastewater Management Programme). From among donor-funded investment projects, most are oriented towards institution strengthening and capacity building.

**Jordan**

The institutional setting in the water sector in Jordan is largely centralised, with the Ministry of Water and Irrigation (MWI) being the official body responsible for the overall water supply and wastewater system, planning and management, the formulation of national water strategies and policies, research and development, information systems, and the procurement of financial resources (Law 18/1988).

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43 *Mesqa* is a distribution canal for irrigation in Egypt. The *mesqa* typically serves an area of 20 to 80 ha.

44 In 1995 the Dutch-funded Fayoum Water Management project established the first water users’organisations at the branch canal or secondary canal level, called a local water board (Abdel-Aziz 2003). These local water boards were responsible for the operation and maintenance of irrigation intake structures of all *mesqas*, possible *saquias* (water wheels), and secondary drainage infrastructure in their command areas, weed control, and domestic water use based on canals and drains. Small infrastructure works were funded by the project where needed. Below this level, infrastructure such as *mesqas*, individual *saquias*, *marwas* or field drains remained fully under the purview of individual farmers and are not the responsibility of the water board. Membership of the water board was made obligatory for all users of water drawn from irrigation and drainage, be they farmers, residents or industries (Ghazouni et al. 2012).
One of the most powerful entities in the water sector is the Royal Commission for Water, consisting of academics and technocrats, and the sector relies on advice given by the MWI. In 2008, the commission produced Jordan’s Water Strategy 2008–2022. The Higher Agricultural Council, which is headed by the prime minister, holds a parliamentary role and is considered to have greater influence on water management policies than the Royal Commission. The council tends to be against implementing water demand management policies, and instead responds more to the powerful farmers and stakeholders of the Jordan River Valley (the “bread basket” of Jordan’s agricultural sector).

The Water Authority of Jordan (WAJ) and the Jordan Valley Authority operate under the MWI at a lower executive level. The WAJ is responsible for municipal water supply and wastewater services, as well as for water resources planning and monitoring, construction, operations and maintenance. The many tasks and responsibilities assumed by the WAJ include:

- establishing plans and programmes to implement water policies and exploit resources for domestic and municipal purposes;
- administering the licensing regime for groundwater;
- studying, designing, constructing, operating and maintaining water and public wastewater projects;

Figure 32. Institutional set-up in the water sector in Jordan
• developing standards and special requirements for the preservation of water and water basins (quality and quantity);
• carrying out related research and studies on water and wastewater; and
• regulating the uses of water, preventing its waste, and promoting its conservation.

The WAJ organisational structure is highly centralised. Service providers/public utility companies, established in three governorates as autonomous corporate bodies with financial and administrative independence linked with the MWI, are responsible for operating and maintaining the water and wastewater systems, dealing with subscribers’ issues, and supervising projects. Most of them enjoy some autonomy, although key tasks are managed centrally, including financial and human resources, capital investment, water quality monitoring, and planning.

The Jordan Valley Authority (JVA) was established in 1973 as a government-owned autonomous public utility company responsible to the MWI for the social and economic development of the Jordan River Valley, including the development, utilisation, protection, and conservation of water resources. In particular, the JVA:

• carries out studies for evaluating water resources (both surface water and groundwater);
• plans, designs and carries out irrigation projects and related works, including dams, hydropower stations, well-pumping stations, reservoirs, distribution networks, drainage works, and flood protection works;
• surveys and classifies soil to determine lands suitable for irrigation;
• settles dispute on water use; and
• organises and directs the construction of private and public wells.

In addition, the JVA is responsible for protecting and improving the environment in the valley. The area of the JVA’s responsibility extends from the Yarmouk River in the north to the Red Sea in the south.

In 1992, Law No. 54 consolidated the previous administrative system under one ministry. According to this law, the MWI, JVA, and WAJ all come under the purview of the minister of water and irrigation. As a result, the minister assumes responsibility for water resources in the kingdom, including the roles and responsibilities set out in the Water Authority Law (Law No. 18/1988) and the Jordan Valley Authority Law (Law No. 19/1988).

At a central level, a number of other ministries may be involved. The Ministry of Health is charged with the control of potable water in order to ensure its fitness for human consumption. In so doing, it is entitled to test potable water resources and their networks to ensure that they are not affected by pollution, and to provide the method used for treating, transmitting, and storing water. The Ministry of Health is also charged with

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45 The JVA’s duties also extend to developing tourism in the valley and studying and improving the agricultural road network.
managing sewerage networks, including all treatment stations, in order to ensure that health conditions are maintained. The Ministry of Environment is the competent authority for developing all standards and specifications governing environmental protection, including water resources.

Since the water sector in Jordan is highly centralised, governorates and municipalities have little or no role in project planning and development, or in the delivery of water services.

Numerous NGOs play a role in local development in Jordan. They exist in the legal form of societies, cooperatives and associations. The JVA began forming WUAs in the Jordan Valley in 2003. By 2013, it had formed a total of 24, with 19 registered as cooperatives and five in the process of registration. These WUAs cover about 65 percent of the irrigated area in the Jordan Valley, with the expectation that, in the long term, the entire irrigated area in the Jordan Valley will be served by WUAs. Although legally registered as independent cooperatives (under cooperative law and by law, as for-profit organisations), the JVA clearly sees these associations as an operational arm of the JVA, with control by the JVA. According to the JVA’s interpretation of the law, WUAs may not collect water fees, and, even though they are legally for-profit organisations, the JVA discourages WUAs from carrying out any income-generating activities. The WUAs are therefore dependent on the JVA for funding. However, the JVA has begun to transfer water management functions to qualified WUAs. At present, 12 WUAs have signed task transfer agreements that provide a limited amount of income, primarily for operational staff salaries. Another four WUAs have signed task transfer agreements with no cost to the JVA, as all operational activities are carried out by volunteers.

The government clearly hopes that in the near future WUAs will become self-sufficient and that the JVA will take on the more limited role of a bulk water supplier, providing water to the WUAs on a contract basis.

**Lebanon**

The institutional framework for the water sector in Lebanon is characterised by a myriad of ministries, water establishments, public agencies, municipalities etc.

The key authority in the water sector is the Ministry of Energy and Water (MoEW). The MoEW has two general directorates: the Directorate-General for Hydraulic and Electric Resources (DGHER) is responsible for research, studies, and the implementation of large-scale projects; and the Directorate-General for Operations (DGO) is responsible for overseeing the public establishment, administration and financial aspects, and mines and quarries.

Among other things, the MoEW is responsible for:

- needs analysis, the measuring, monitoring and control of water resources, the measuring of water quality and the setting of standards;
- planning the utilisation and distribution of water resources;

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46 Under the umbrella of the donor-funded GIZ project.
47 Law 221 of 2000.
- designing, building and putting into operation major water facilities;
- implementing the artificial recharge of groundwater when required and regulating the volumes of groundwater extracted;
- issuing regulations on water resources protection, including law enforcement;
- licensing wells and all water extraction from rivers and public water resources according to applicable laws and regulations;
- conducting continuous hydrological, geological and hydro-geological research, studies, data gathering and mapping pertaining to the water sector;
- providing administrative supervision and oversight of all public water institutions;
- enhancing the operational performance of regional water establishments and monitoring their performance according to approved benchmarks;
- setting the standards and benchmarks that the regional water establishments (RWEs) will need to abide by in their design and operation of water supply, irrigation and wastewater systems;
- conducting all land expropriations for the MOEW and RWEs in conformity with existing laws;
- providing advice on the licensing of mines and quarries when such mines and quarries have an impact on water resources; and
- conducting public outreach in order to provide information on water-related issues and ways to conserve water.

Law 221 of 2001 and its amendments created four regional water establishments (RWEs): Beirut and Mount Lebanon Water Establishment; North Lebanon Water Establishment; South Lebanon Water Establishment; and Bekaa Water Establishment. Lebanon had 21 water establishments and over 200 local water committees, mainly active in irrigation, before Law 221 was approved. The MoEW exercises administrative supervision over the Regional Water Authority (RWA), the autonomous water boards and local committees through the DGO. The RWEs were given responsibility for:

- planning, building, operating and maintaining potable and irrigation water transmission and distribution networks;
- planning, building, operating and maintaining sewage treatment plants and networks;
- ensuring the quality of water supplied to their communities;
- recommending tariffs for water, irrigation and wastewater (based on prevailing socioeconomic conditions); and
- overseeing works, studies, and operation and maintenance by private service providers.

Financially, the RWEs are subject periodically to government audit, and their administrative activities are subject to the government’s administrative regulator (the Central Inspectorate). They have the power to recommend tariff structure and rates to
the MoEW, but not to set them. The RWEs were given autonomy and control of their human resources.

The Litani River Authority (LRA) was established with responsibility to manage the Litani River Basin (to plan and operate all potable, irrigation and hydro-electrical schemes associated with the Litani River; measure all surface flows throughout the country; and establish and operate hydroelectric power plants on the Litani River). The LRA is the only water authority to retain special responsibilities and functions that extend beyond its administrative region (the natural boundaries of the Litani Basin). It is responsible for developing and managing irrigation water and associated works in southern Bekaa and South Lebanon. It is also in charge of measuring surface water along the Lebanese territory.

![Organisational Chart](image)

**Figure 33.** An organisational chart of the institutions governing the water sector in Lebanon

With regard to water infrastructure development, the Council for Development and Reconstruction (CDR) was set up after the end of the civil war in order to guarantee the financing of infrastructure projects and to supervise their execution. The CDR is responsible for preparing national sector plans in coordination with the different line ministries. It is accountable to the Council of Ministers through the prime minister, and at present water projects represent the bulk of its work, along with road construction.

Other line ministries also have responsibilities in the water sector. Due to the legislative vesting of environmental impact assessments and strategic environmental assessments with regard to infrastructure, the Ministry of Environment has progressively become more involved, especially as it is responsible for the setting of standards and is at the forefront of climate change–related activities. The Ministry of Agriculture retains a focused role concerning the management of water at farm level. Depending on the issue at stake, other ministries may be involved (e.g. of Public Health, the Interior, Municipalities and Rural Affairs). At cross-ministerial level, the discussion on establishing a national water council has been ongoing for the last decade, with the outcome yet to be seen.
Table 25. Water resources planning matrix in Lebanon

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Local governments (governorates, districts and municipalities, including unions of municipalities) have legal responsibilities, notably regarding public health and pollution control, but limited staff, capacity and funds to actually exercise them. Before the reforms
to the water institution system in 2000, the water sector in Lebanon was more decentralised, with 209 local water committees (LWCs) playing an active role. The 2001 law did not abandon water committees, but envisaged a two-year transitional period for their transformation. Unfortunately, the necessary by-laws were never passed and currently these institutions remain active, but their mandate needs clarification.

Actual functions often differ from legal mandates, actual capacity and efficacy. For example:

- the LRA operates gauging stations nationally because of its capacity to do so, although it is not supposed to work outside the Litani River Basin;
- the MOEW is in charge of riverbed maintenance and of preventing infringements, but has no field staff or capacity to do so; nevertheless, it refuses to delegate the responsibility (e.g. to the LRA, which has done maintenance work on the Litani River); and
- the RWEs are far from having the financial/administrative autonomy they are supposed to have according to Law 221.

Currently, initiatives on decentralised water governance are ongoing, mainly as donor-driven efforts. For example, USAID is very active in the development of so-called water federations of municipalities through the project “Litani River Basin Management Support Programme”.

The experience of Lebanon with WUAs has been very limited. Legislation for WUAs was created during the French mandate (Decree 320S of 1926) and not adapted to the local realities. Since then, only one WUA has been created in the northern part of the country, but without any trace. However, the National Water Sector Strategy, approved in March 2012, re-establishes public participation in water issues and the role of WUAs. The strategy envisages the creation of formal WUAs to replace the different organisations currently in charge of operating and managing irrigation schemes; and the definition of the roles and responsibilities of WUAs and other partners with respect to water management (including water quality), in close cooperation with the intended beneficiaries.

Libya

Water institutions in Libya before the violent conflict were established through decisions of the Ministerial Council and following a much centralised approach. The main institutions with an influence on water management included:

- The General Water Authority (GWA) under the Secretariat of Agriculture, Livestock and Fisheries, responsible for the assessment, planning and management of water resources. It provided advice to water users, formulated water legislation, designed water structures and supervised their construction, operations and management, and monitored and implemented water legislation. The GWA was entrusted with:
  - conducting studies and research to ensure the optimum utilisation of available resources;
• The National Company for Water and Wastewater (GCWW) was set up in 2008 with headquarters in Tripoli and eight branches across the country. It is within the General Corporation for Housing and Utilities and dealt with water supply from any source (groundwater, surface water, desalination plants, treated wastewater) and with wastewater treatment and sanitation. The responsibilities of the GCWW included:

  o the operation and maintenance of transmission and distribution networks and water pumping stations and control centres, to ensure the provision of better services to users;
  o the operation and maintenance of drainage systems and related treatment plants, filtration, pumping, and monitoring and control, to ensure the provision of better services to users;
  o the installation and connection of sanitation services for consumers;
  o the supply of water to consumers and conducting studies on the development of consumer services, leading to the development of water services in all areas;
  o taxes for water and sanitation services, according to the rules of the organisation;
  o the creation of human resources training plans for the development of the relevant authorities, and support to those programmes and plans;
  o undertaking studies and technical and economic research relevant to transportation systems, water distribution and maintenance projects and the construction of sanitation systems;
  o proposing policies for water and sanitation and the rules necessary to regulate activities, including design, development and expansion;
  o proposing specifications and standards in the field of water and sanitation; and
  o proposing strategic long-, medium- and short-term plans for water and sanitation and transmitting them to the relevant authorities for approval.

• The Great Manmade River Authority (GMRA), responsible for groundwater exploitation and its transportation from the southern well fields to the coastal area.
• The National Company for Desalination under the Secretariat of Electricity, Water and Gas, responsible for planning, designing, implementing and operating the seawater desalination plants.

• Local companies for water and wastewater operate at shabiyat level and are responsible for operating and maintaining water structures developed by the GCWW.

• The Great Manmade River Utilisation for Agriculture Authority operates under the Secretariat of Agriculture, Livestock and Fisheries and is responsible for designing and constructing water structures (distribution and drainage networks, reservoirs, irrigation systems) necessary to make use of the water transported from the south for agricultural purposes. It has responsibilities for the management of transported water supplied by the GMRA to irrigation projects set up by the government. Some private farms also now receive transported water.

• The General Environmental Authority was responsible for water quality monitoring and assessment.

The institutions involved in the operation and management of the water sector were numerous and their tasks were often overlapping. Moreover, the status and functions of the various institutions keep changing, and this affects their internal planning and the way they operate. One of the major issues in the water sector is the lack of planning at top level and the lack of coordination between institutions. This multiplicity of management systems does not favour rational and standard water management practices. This makes it difficult to attain the sound development and utilisation of water resources.

**Morocco**

Overall, the Moroccan water sector has a strong regulatory framework and a good level of performance. A particularly strong point, both in the documents and in practice, is the identification of policy goals and the allocation of responsibilities to achieve them.

Morocco’s water sector has a large number of important actors, many of whom wield substantial influence in at least one function. Given the country’s great reliance on water for agriculture and its economy, it is no surprise that so many actors are involved. Morocco is a monarchy that has been steadily devolving power, and the structure of its water organisations seems to mirror this.

In terms of water policy setting, the High Council of Water and the Climate (CSEC) is the key agency at national level. It has mainly a consulting role. It is responsible for formulating the general orientation of national water and climate policy and for examining national strategy with respect to knowledge of the climate and its impact on water resources; the national water plan; and plans for the installation of integrated water resources. Half the members of the CSEC are representatives of the state, agencies and public operators (National Office for Drinking Water Supply (Office National d’eau Potable, ONEP), National Office for Electricity (Office National de l’Électricité, ONA(M)), Regional Agricultural Development Authority (Offices Régionaux de Mise en Valeur Agricole, ORMVA)); and the other half are non-governmental stakeholders, including water users, prefectural and provincial assemblies, academic and research institutions, and scientific or professional associations.
At the policy setting and implementation level, the country has three main water agencies that hold most of the influence (the Water Secretariat of the Ministry of Energy, Mining, Water and the Environment; riverbasin agencies; and the Ministry of Agriculture), under the leadership of the Water Secretariat. The larger influential organisations, like the Ministry of Agriculture, have devolved power to organisations designed to fill specific tasks, such as ORMVA, which is in charge of irrigation and reports to the Ministry of Agriculture. Similarly, the State Secretariat in Charge of Water and the Environment (Secrétariat d’Etat chargé de l’Eau et de l’Environnement, SEE) has largely delegated the provision of potable water to ONEP, which appears as an influential organisation in the water sector.

The Ministry of Energy, Mining, Water and the Environment (MEMEE), responsible for the management and protection of water resources, as well as for its quantitative and qualitative monitoring, is a major player in the water sector. The SEE operates within the ministry. The MEMEE supervises several organisations that are responsible for the implementation of water policies: the National Agency for Energy and Drinking Water (Office National de l’Electricité et de l’Eau Potable, ONEE48, which grouped together the former ONEP and ONE in 2009), and the National Agency for the Sanitary Safety of Food Products (ONSSA), which ensures the quality of the products of wastewater re-use, etc.

Among the directorates, the Directorate-General of Hydrology (DGH) is in charge of the elaboration and implementation of government policy for water resources planning, mobilisation, management and preservation, and the management and maintenance of large hydraulic infrastructure. The Directorate-General for Water Research and Planning is in charge of water resources management, while the Directorate for Hydraulic Infrastructure is in charge of the implementation and maintenance of large hydraulic infrastructure. It is also in charge of the construction of small dams, in collaboration with the Ministry of Agriculture.

The MEMEE also supervises riverbasin agencies (Agences du Bassin Hydraulique, ABHs), upgraded to real architects of the planning, management and protection of the country’s water resources. As public companies that are independent and administrated through a board of directors, ABHs are responsible for water resource administration at regional level, allowing for decentralised management. Institutionally benefiting from financial autonomy based on the “user pays” and “polluter pays” principles, such agencies represent a modern, internationally acknowledged water management approach. The mandate of the ABHs is to:

- maintain public hydraulic infrastructure and regulate its use and exploitation;
- enhance the economic value of water;
- provide financial and technical assistance for water management;
- develop local IWRM plans and pursue their implementation;
- issue permits and authorise the use of public hydraulic infrastructure;

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48 The ONEE is a public autonomous company that is the major national water producer, and, if rural water supply is included, also the dominant national water distributor. It delivers water to 416 urban settlements and 198 small rural settlements, but also to more than 3,500 camps and nomadic villages.
• provide the necessary support for water pollution prevention;
• perform studies and assessments of water quantity and quality issues;
• propose and implement regulatory measures, as appropriate; and
• maintain the inventory of water use rights and concessions and permits for water abstraction.

In the above context, the main responsibilities of the ABHs are to: (i) develop water resources through water resource planning and management, assessment, exploitation, quantity and quality monitoring, and the control of water use; (ii) protect water resources and the national heritage by safeguarding the public hydraulic domain, preventing and managing exceptional situations, and operating, maintaining and exploiting hydraulic works; and (iii) provide services towards third parties by offering technical assistance and receiving benefits for services delivered, develop partnerships and offer financial support. As they have access to their own financial resources (revenues from relevant levies), the ABHs can grant loans, assistance and subsidies to all institutions and individuals for the management and protection of water resources. Through the introduction of the “polluter pays” and “user pays” principles, the new law provides the means to finance the protection and rehabilitation of water bodies. The application of these principles is in the process of finalisation.

One ABH was established for each of the nine main river catchments in the country. The ABHs are overseen by the Council of Administration, representing the state (33 percent); public providers of water, irrigation and hydroelectricity (25 percent); and other actors such as the Chamber of Commerce, Industry and Services, prefectural and provincial assemblies, ethnic groups and water users’ associations. The council, chaired by the secretary of state for water and environment, meets twice a year. At the local level, the direct interlocutors of river basin organisations are 60 provincial and prefectural commissions, in charge of contributing to the integrated hydrological plan, encouraging economies of water and the prevention of pollution, and raising awareness about water scarcity. A technical cooperation agreement for achieving targeted actions was signed in 1996 (and renewed in 2002) between the French and the Moroccan ministries in charge of water. This agreement also outlines cooperation at a decentralised level between French and Moroccan basins.

According to the Water Act, ABHs are legally and financially independent, as they should be financed through user fees. However, the reality is different and the responsibilities that have been entrusted to the ABH administrations are too large in relation to their financial and human resources. In that regard, a common decision support system would overcome some of the current staff limitations, increase transparency, and speed up licensing procedures.

The administration boards of the ABHs encompass governmental and non-governmental water stakeholders and are responsible for several key tasks regarding administration, planning and financing. Their composition aims to empower all relevant users, but the fact that they seldom meet (at most twice a year) hinders their stronger involvement in an integrated water management process.

The management of the large irrigation area is implemented through the various ORMVAs, which are autonomous bodies that operate under the umbrella of the Ministry
of Agriculture. The ORMVAs are in charge of managing irrigation waters at the irrigation district level. Their mission includes the management of irrigation districts; the exploitation and maintenance of irrigation equipment at the irrigation district level; the provision of technical assistance to farmers; and the collection of irrigation water fees.

Several other ministries are involved in water and wastewater planning, monitoring and pollution control besides the MEMEE. The Ministry of the Interior plays a substantive role in water and sanitation at the municipal level. The ministry is responsible for water supply and wastewater collection in local communities, supporting the operations of basic water and sewerage infrastructure, and monitoring the performance of the régies autonomes and municipal concessions. The ministry also provides coordination and technical assistance on water and sanitation to local communities and is in charge of monitoring the performance of the water utility companies (régies) and the private companies that provide water supply, sanitation and electricity to local communities, as a rule through concession arrangement. This task is undertaken through two specific directorates: the Direction Générale des Collectivités Locales and the Direction des Régies et Services Concédés.

The Ministry of Agriculture and Fishing is in charge of developing and implementing government policy in relation to agricultural production and rural development. It also plays a major role in water resources management, since 87 percent of the nation’s water resources are allocated to irrigation. The Ministry of Agriculture is responsible for irrigation policy; on which it coordinates with the SEE. The Ministry of Domestic Affairs also collaborates with the SEE on water development projects. In addition, the Ministry of the Interior oversees the implementation of the National Water Sanitation and Cleansing Plan. The Ministry of Economy and Finance also has an important role to play, as it finances investments through the state budget. Other ministries are involved according to their specificity: the Ministry of Health, through its mission to protect public health; and the Ministry of Trade and Industry, as the custodian of the Moroccan Department of Industrial Standardisation (SNIMA).

According to the municipal code of 1976 (Charte Communale), amended in 2002 and 2008, public services such as water supply, sewerage and electricity distribution, are the responsibility of municipalities (communes).

In 2002, the Moroccan Government decentralised responsibility for water supply and sanitation services to the municipalities, which can now choose among four options for managing water services: (i) they can manage water services themselves under a régie publique contract; (ii) they can create an independent public provider to which they can delegate water services; (iii) they can delegate water services to the ONEE; or (iv) they can contract out water services to private firms. Some municipalities have delegated service provision to private concessionaires. In other municipalities the régies provide these services, often not on the basis of a specific contract. In the smaller municipalities, the ONEE often provides services, either with or without a contract (contrat de gestion déléguée) with the municipality. In the case of sewers, many smaller municipalities still provide this service directly, although there is a policy to gradually transfer sewerage services to the ONEE. Accordingly, there are currently four categories of urban service
providers: private concessionaires (38 percent of urban water customers)\textsuperscript{49}, municipal utilities (régies autonomes, 12 specialised municipally owned public operators, 31 percent of urban water customers)\textsuperscript{50}, the national public company ONEE (28 percent, about 500 medium to small towns), and municipalities providing services directly (régies directes, 3 percent).

Although WUAs were established in Morocco shortly after independence, they wielded very little power until the 1990s, when a government decree (Law No. 02-84 of 1990) gave them the name “agricultural water users associations” (Association d’Usagers de l’Eau Agricole, AUEA) and gave them more power over local water distribution. Their current role is to oversee service levels, charges and water allocation. Almost all medium-sized and small public schemes in Morocco are presently fully managed by AUEAs. Each member pays dues to cover the expenses of their AUEA, which also results in more personal involvement in the water sector and greater incentive to maintain the system. The AUEAs in Morocco also give farmers some influence in national irrigation policies. An association for irrigation water users can be created at the demand of two-thirds of the farmers in an irrigation district. They aim to help farmers to implement irrigation and drainage programmes and to manage irrigation infrastructure. The AUEA sits in on the board meetings of the ABH and therefore contributes to formulating water policy at the basin level. However, in most large-scale public irrigation systems, the AUEAs have remained weak (Haouz, Tadla) or non-existent.

In addition, the ONEE works to develop the necessary local capacity through three main strategies: (i) it involves the local population through the management of public standpipes (bornes-fontaines) and a system of local water managers (gardiens gérants) chosen by the community; (ii) it uses financial incentives to stimulate the creation of drinking water users associations; and (iii) it mobilises the expertise of local micro-enterprises for system maintenance. To date, 45,000 gardiens gérants have been chosen to manage more than 5,000 standpipes and around 6,000 drinking water users’ associations have been created to manage water facilities serving more than 2 million inhabitants. These two services cover 46 percent of the population who have water access in rural areas. In addition, 600 micro-enterprises have been created in partnership with young graduates.

The AUEA General Assembly elects six out of a total of seven members of the council (conseil), the so-called seventh member being a government representative. The council is responsible for preparing the annual budget of the AUEA and for implementing the decisions taken by the General Assembly. However, in practice the irrigation agencies controlled the formation of many AUEAs and incorporated local notables (elites) in the administration of rural areas, while in exchange these rural elites provided political support to the central administration.

The 2008 amendment to the municipal code allowed for the creation of municipal associations (groupement d'agglomérations urbaines).

\textsuperscript{49} Private water operators have been engaged in the four major agglomerations (Casablanca, Rabat, Tangier and Tétouan)

\textsuperscript{50} Currently, independent public companies are in charge of sanitation and wastewater treatment in 12 urban areas across the country.
The private sector is growing in importance in Morocco’s water sector as well. As part of its move towards public-private partnerships, many Moroccan government agencies have begun to rely more on consulting companies for advice and technical support. These consulting companies tend to be either home-grown Moroccan companies or foreign firms that work directly with Moroccan consulting companies.

**Syria**

Before the conflict, the water sector in Syria was managed by several institutions and ministries, with slightly overlapping responsibilities:

- The Ministry of Irrigation (MoI) was responsible for water management and development, together with the routine monitoring of surface water and groundwater quality and water provision for irrigation purposes.
- The Ministry of Agriculture and Agrarian Reform (MoAAR) was in charge of the economic use of water for irrigation purposes in agricultural areas, including the search for modern techniques that reduce water losses and focus on growing crops that have low water consumption and are tolerant of salinity.
- The Ministry of Health, Housing and Construction (MoHHC) was in charge of supplying rural and urban areas with drinking water, as well as wastewater treatment plants.
- The Ministry of Environment and Local Administration (MoELA) was in charge of monitoring water quality and developing the conditions necessary for water resources protection.

Each of the above ministries had a number of representative directorates at province or basin level. The MoI, for example, had a general directorate of the basin and a directorate of wastewater pollution control in each province. The MoELA had specialised directorates for water protection and waste management. The MoHHC had companies for drinking water and sanitation and companies for sewage water in all Syrian provinces.

The complexity of the Syrian administrative system applies to water governance. The MoHHC and the MoELA are responsible for drinking water, and the MoI for irrigation, while the MoAAR is in charge of the application of modern agricultural techniques. These ministries were all represented in the Higher Water Committee, presided over by the deputy prime minister for service affairs.

The General Commission for Water Resources (GCWR) of the MoI deals with issues concerning integrated water management and with the coordination of the water resources directorates established in the different river basins.
Table 26. Water resources planning matrix in Syria

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**Tunisia**

Water management in Tunisia is characterised by the prevalence of public sector administration, with the Ministry of Agriculture and Hydraulic Resources (Ministère de l'Agriculture de l'Environnement et des Ressources Hydrauliques, MARH) playing a central role. Most tasks related to water resources management fall under the responsibility of the ministry and the directorates/institutions under its authority. The ministry structure
includes three technical departments: the Directorate-General of Water Resources (DG/RE), in charge of water resources evaluation, monitoring and preservation; the Directorate-General of Dams and Great Hydraulic Works (DG/BGTH), in charge of the construction and exploitation of dams; and the Directorate-General of Rural Engineering and Water Exploitation (DG/GREE), in charge of the construction and exploitation of irrigated perimeters and the development of drinking water systems in scattered rural settlements. On the other hand, the Directorate-General for the Planning, Management and Conservation of Agricultural Lands (DG/ACTA) is involved in natural resources evaluation and preservation, as well as in the hydrological and hydro-geological aspects of water resources. In addition, a specialised department attached to the cabinet — the Bureau of Water Planning and Hydraulic Equilibrium (Bureau de la Planification et des Équilibrbes Hydrauliques, BPEH) — is in charge of coordination among the various actors, planning for water development, and the allocation of water resources. The implementation of national water-related policies and tasks related to water resources management also come under the responsibility of the national water utility company — the National Company for Water Exploitation and Distribution (Société Nationale d’Exploitation et de Distribution des Eaux, SONEDE), which is in charge of drinking water supply; DG/ACTA; the National Institute for Research on Rural Engineering, Water and Forests (INRGREF); regional offices for agricultural development (Commisariats Régionaux au Développement Agricole, CRDAs); the National Water Committee (Comité National de l’Eau, CNE); the company responsible for the exploitation of conveyance networks in the north (SECADENORD), which constructs and operates hydraulic transfer systems; and the Hydraulic Inventory and Research Bureau (BIRH). As a rule, all institutions are under the supervision of the ministry.

The MARH is represented at regional level by 24 regional water management authorities (CRDAs), established in each of the 24 governorates of the country. The CRDAs undertake tasks relevant to the assessment of water resources; the monitoring of water resource use; the implementation of irrigation and potable water supply projects; and the maintenance and updating of the respective regional databases on water resource exploitation and use, water quality, availability and allocation, in line with the requirements of the National Information System of Tunisia.

Among the above authorities, SONEDE has been established as a national utility for providing potable water all over the country. In this regard, the utility undertakes projects relevant to the exploitation, maintenance and rehabilitation of facilities and infrastructure for water abstraction, conveyance, treatment and distribution. At present, SONEDE, which employs 7,500 people and is regionally represented in all 24 governorates, is responsible for:

- the production, treatment and distribution of an annual 317 million m³ of drinking water through a conveyance network of 30,000 km;
- water distribution, the operation and maintenance of networks, and the provision of drinking water to 1.4 million customers; and
- the preparation of feasibility studies with regard to waterworks.

Furthermore, the Ministry of Environment and Sustainable Development (MEDD) is also involved directly in the water sector and is responsible for water resources pollution control and monitoring through the National Sanitation Office of Tunisia (Office National
de l’Assainissement - ONAS), which is responsible for the implementation and operation of wastewater treatment plants; the National Environment Protection Agency (ANPE), responsible for pollution control; and the Tunis International Centre for Environmental Technologies (CITET). Other ministries intervene in the water sector according to their prerogatives, mainly the Ministry of Transport for meteorological data collection, the Ministry of Equipment for urban flood control, and the Ministry of Health for sanitary control.

Table 27. Water resources planning matrix in Tunisia

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In terms of water legislation, the 1975 Water Code constitutes the pillar of the water legislative framework in Tunisia. The Water Code addresses all aspects of the management, use, development and protection of water resources in the hydraulic public domain. It defines the regulatory provisions concerning the right to use water, authorisations or concessions affecting the public domain, water pollution abatement, flood protection etc. The hydraulic public domain, as defined by the Water Code, is an inalienable and imprescriptible domain that includes rivers, springs, underground water, lakes, wells, sanitation canals of public utility, etc. In 2001, the Water Code was amended (Law 116/2001) to include two main principles: to extend the water resources development concept to non-conventional resources; and to introduce sustainable development and preservation obligations, considering water resources as a national wealth. In addition, several laws and regulations have been adopted to address new concerns, including environmental issues (e.g. Decrees 1261 and 1262/87 on the establishment and operation of WUAs; and Decree 1047/89 on the re-use of treated water in agriculture). The goal of the Water Code reform, initiated recently by the Tunisian Government, is to review and update the overall water legislation and ensure its coherence and integration with other legislation.

Aspects related to information and public participation are guaranteed, to some extent, by the Municipal Organic Law, which requires the municipal council to inform the public and give citizens the right to attend/participate in meetings and council deliberations. However, the system as applied does not include specific mechanisms for public information and consultation, or for addressing public grievances to ensure that impacts are mitigated to acceptable levels.

At local level, irrigation and rural drinking water systems management is transferred to WUAs. The involvement of Tunisian farmers in water management has historical antecedents, all assisted by the state bureaucracy. The creation of WUAs (Public Interest Associations, or Associations d’intérêt collectif, AIC) as organisational entities grouping together all farmers belonging to a given irrigated area, was an important step in the water sector decentralisation process that started in Tunisia in the early 1970s. The aim of creating these associations was to increase farmers’ participation in decision making and resource management. They were also expected to play a crucial role in the irrigation cost recovery strategy of the government through fee collection and investments in irrigation development. The broad experience with AICs led to the creation and implementation of the National Strategy for the Promotion of Water Users Associations (Stratégie Nationale de Promotion des AIC) in 1992. In 1999, the government introduced a new entity: the Groupement de Développement Agricole (GDA). The main stated objectives of the GDAs were: natural resources preservation, agricultural work, the provision of equipment, agricultural inputs, productivity improvement, technical advice and marketing. The GDAs’ income may include service fees, income from other activities, and other sources (loans, loans, etc.).

51 In the 1920s, collective interest associations (Associations d’Intérêt Collectif, AICs) were developed for the management of irrigation water in the oasis of Zarzis (South Tunisia). In the middle of the 1980s, the regional branches of the Ministry of Agriculture (CRDAs), with USAID support, re-activated the AICs to become local bodies for water resources management. However, the Ministry of Agriculture also re-activated Groupements d’Intérêts Collectifs (GICs), dating from the colonial era, to ensure the management of water resources.
subsidies, donations etc.). Expenditures may be on operation and management, GDA administration, the reimbursement of loans, and other expenditures. In 2004, Law 2004-24 transformed all the AICs and Farmers’ Associations in Tunisia (Groupements d’Intérêts Collectifs—GICs) into GDAs. These GDAs had to enter into a contract of operation with the CRDAs. In 2007, the number of WUAs was 980 for irrigation systems and 1,260 for drinking water systems.

In Tunisia, WUAs are established through government funding (the Ministry of Agriculture at the initiative of interested parties or the wilaya and are given responsibility for the collection of water fees as well as service-related fees (infrastructure maintenance, investments etc.). Responsibility for the approval of WUA establishment lies with the ministry after comments and a feasibility study have been submitted to the hydraulic interest group (Groupement d’Intérêt Hydraulique, GIH) of the area, which formulates an opinion that is transmitted to the government. Accordingly, WUAs are subject to the general supervision of the local governor. Members of a WUA may be owners and tenants of agricultural land, assignees of public land, managing councils of collective lands, cooperatives, users of collective water development systems, local or regional public bodies and users of public domain waters. Membership is voluntary and open to all water users who meet the membership criteria. The rights and duties of members are clearly spelled out in the law. The number of WUAs for irrigation water management has risen sharply, from about 100 in 1987 to 1,250 in 2006, managing around 200,000 ha or 75 percent of the public irrigated areas in Tunisia.

In most of Tunisia (with the exception of the oasis areas), irrigation schemes using groundwater are usually managed by GDAs. Farmers in some GDAs have collectively defined a few adaptation strategies. In the Nadhour region, for example, GDAs have stopped supplying water to farms outside the scheme, or, at the start of the year, they limit irrigated areas per farmer to reduce pressure on the water tower. However, based on GDAs studied in Nadhour, farmers are unable to coordinate themselves to diversify their produce and irrigation dates and times. The specialisation of all farmers in the same financially profitable irrigated crops causes water consumption peaks, during both the year and the day (ADB 2011).

At present, the WUAs in Tunisia have private legal status, the bases of which are sometimes unclear to stakeholders and often poorly formalised. On paper, these new entities enjoy a large degree of autonomy from the government. The GDAs are managed by an administrative council composed of three to nine members belonging to the association and elected by the general assembly for a total period of three years. The president of this administrative council is chosen from among these elected members. The president’s main mission is to represent the interests of the GDA in its relationships with the public administration and other actors. However, in practice the administrative council is usually appointed in agreement with the local government and contributes to the political propaganda and financial support for the ruling party (Ghazouani et al. 2012). Consequently, most GDAs are dominated by local or higher-level political powers, which tend to undermine their legitimacy and make them ineffective. In addition, GDAs are under the bureaucratic supervision of the Ministry of Agriculture, the Ministry of Finance and the Ministry of the Interior, which makes their operation a difficult task. In spite of the transfer to farmers’ organisations and the involvement of farmers in decision making, the central administration and political institutions still dominate the organisational
landscape. In the Tunisian legal framework, the roles and responsibilities of the WUAs seemed to be oversized, whereas the state role — however dominant it remains — is not clearly defined (Ghazouani et al. 2012).

**Water security in MENA countries: Drivers and responses**

**Drivers**

The preceding chapters have largely focused on the state of water resources in the MENA countries and pressures originating from the water sector itself (internal pressures). However, pressures on the MENA region’s water sector also come largely from trends, tendencies and occurrences that are external to the water sector (population growth and rapid urbanisation; climate change; changes in agriculture and other economic activities; pressure from new lobbies for clean water etc.), which are commonly referred to as drivers.

**Climate change**

Globally, climate change is evident in rising mean temperatures, melting glaciers, rising average sea level and the increasing frequency of extreme weather events, such as droughts, floods and storms. As a largely arid region, the MENA region is particularly vulnerable to climate-induced impacts on water resources, yet promoting adaptive governance strategies to deal with increased hydrological risk remain a low priority for political leaderships. It is increasingly clear that climate change will interact with other social, economic and political variables to exacerbate social and political vulnerabilities.

Experts agree that the MENA region has been adversely affected by global climate change over the past two decades, and that that the region may see more frequent and severe droughts in the future. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change projects strong changes in climate across the MENA region. Several other independent studies have also suggested a major reduction in precipitation, ranging from 10–30 percent in the MENA region by next century (Conway and Hulme 1996; Arnell 1999; Sánchez et al. 2004; Milly et al. 2005; Suppan et al. 2008; Evans 2008). High-resolution climatic models conducted in the Middle East predict an increase in mean annual temperature up to 4.5°C that coincides with a 25 percent decrease in mean annual precipitation towards the end of the 21st century (Suppan et al. 2008). Temperature increases combined with substantial decreases in precipitation are projected. An increase in temperature results in a higher evapotranspiration demand and will, in combination with a decrease in precipitation, severely stress the water resources in the region.
Table 28. Generalised overview and likely future trends in temperature and precipitation in the analysed MENA countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Recent trends</th>
<th>Future trends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature</td>
<td>Temperature</td>
</tr>
<tr>
<td>Algeria</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Egypt</td>
<td>↑</td>
<td>–</td>
</tr>
<tr>
<td>Jordan</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Lebanon</td>
<td>↑</td>
<td>–</td>
</tr>
<tr>
<td>Libya</td>
<td>↑</td>
<td>–</td>
</tr>
<tr>
<td>Morocco</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Tunisia</td>
<td>↑</td>
<td>–</td>
</tr>
</tbody>
</table>

Increase (↑); decrease (↓); no change (–)

The Levant (Syria, Lebanon, Palestine and Israel) will be most affected by changes in precipitation (Chenoweth et al. 2011). For example, climate modelling exercises notably estimate that in Lebanon, a 1.2°C increase in temperature is projected to decrease water availability by 15 percent because of changed runoff patterns and evapotranspiration. In Jordan, the average annual water yield (i.e. aquifer replenishment) is expected to decrease by a staggering percentage (45–60 percent) due to a combination of a 2°C increase in temperature along with a 10 percent reduction in precipitation. The present water deficit in Jordan is therefore expected to intensify further. According to the 2007–2008 Human Development Report, similar deficits are forecast for Syria, where a 50 percent decline in renewable water availability is expected by 2025, compared to 1997 levels. In Egypt, higher temperatures could double or quadruple death rates during heat waves.

Most climate models predict a decrease in precipitation combined with a surface temperature increase in the Eastern Mediterranean, which will result in decreased water availability and enhanced water deficit in the Lower Jordan River Basin (Israel, the West Bank and Jordan). Precipitation is predicted to decrease by 25 percent in the Upper Jordan River catchment and aquifer recharge zones in northern Israel, Lebanon and Syria (Suppan et al. 2008). In North Africa, even modest temperature increases could dramatically change water availability. For Morocco, precipitation over the Atlas Mountains will determine the flow in major rivers and the replenishment of several important aquifers of the Souss–Massa Draa, Ziz and Tadla basins. For example, a 1°C increase could reduce water runoff in Morocco’s Ouergha watershed by 10 percent by 2020. If the same results hold for other watersheds, the result would be equivalent to losing the water contained by one large dam each year.

The MENA region is threatened by desertification and the degradation of ecosystems due to global warming and the overuse of natural resources, which will exacerbate the problem of water scarcity. Desertification is expected to threaten 14 percent of Algeria’s land base and 52 percent of Morocco’s land base, while in Egypt, 30 to 40 percent of total irrigated land is affected by salinisation.

In terms of possible climate change impacts, the analysed countries can be classified into three groups: (1) countries that on average have adequate quantities of renewable water, but where within-country and within-year variations are problematically large (Lebanon, Morocco and Tunisia); (2) countries with consistently low levels of renewable water
resources, which are thus highly dependent on non-renewable groundwater sources and supplies from seawater desalination (Jordan); and (3) countries that mainly depend on the inflow of transboundary rivers (Syria and Egypt) (World Bank 2007). The biggest challenge in the MENA region is that countries have to manage an unusual combination of low annual precipitation, which is, at the same time, highly variable.

Overall, the incremental effects of climate change scenarios are expected to exacerbate current pressures on water resources due to higher spatial and temporal rain variability, lower precipitation, lower runoff, higher evapotranspiration rates, and increased natural events. As a result, renewable surface water and groundwater will be reduced with a direct effect on the allocation of water among sectors and the environment and the disruption of water management and services, and potentially giving rise to tensions over water allocation especially among riparian transboundary group countries. Competition and conflict among countries, sectors, communities and individuals over water are likely to occur. The farmers’ lobby is likely to demand more water, arguing that crop needs increase with temperature and rainfall variability. Urban water utilities will demand more water to meet the needs of growing, more prosperous populations. Finally, increased environmental flows will continue to be necessary for rivers and streams to maintain and regenerate themselves (Vijay Jagannathan et al. 2009).

*Change in economic activities (notably farming practices)*

A second set of factors outside the water sector is related to pressure from farmers benefiting from the recent growth of high-value agriculture. These farmers have secured significant gains in income by adopting agricultural and irrigation practices that have enabled them to join the supply chain to high-value consumer markets in Europe and North America. Their prosperity is reflected in a change in water consumption (Vijay Jagannathan et al. 2009; World Bank 2007). However, in terms of the allocation of water resources among economic sectors, the MENA region shows a significant water-intensive input to average agricultural output ratio: the agriculture sector uses nearly 85 percent of total water resources, generated only 8 percent of the GDP on average in 2005, and employs about 29 percent of labour, mostly in rural areas.
While almost all countries in the region have sought to expand water distribution and storage systems through dams and canals, significant water consumption demand management was not undertaken until severe droughts and falling water supplies in aquifers and reservoirs became critical. This has been the case in Morocco, and is increasingly the case in Jordan and Algeria (Sowers et al. 2010). Nonetheless, agricultural products account for a large share of merchandise exports from many MENA countries. Changes in agricultural production in MENA countries due to water shortages induced by climate change and/or changes in water allocations will severely impact farming constituencies in the absence of effective state and community interventions.
Economic and social drivers related to jobs, employment, income and export earnings, inter alia, all have an influence on water use and are interconnected with food security, not just among the rural agricultural population but also among urban-based non-agricultural populations. Food security (at national or household scale) is thus not the sole aspirational outcome of water use and management. The overall goal of countries in the region is to secure sustained agricultural growth, reduce poverty, and improve food security. This overall goal means diverse drivers affecting water.

Consequently, although urban demand for water has been rising steadily in MENA countries, agriculture continues to consume the most water. The major problem is that irrigation is favoured over household use, and commercial farming (especially for export crops) is favoured over (generally smaller) farms producing for local markets. Typical irrigation practices in MENA use 10,000 m$^3$ of water per year for every hectare. That same quantity of water would meet the basic (drinking and hygiene) requirements of 1,000 people.

Despite the increase, agricultural performance and food production have failed to advance in many Arab countries. In Jordan, for example, over 60 percent of water is used for agriculture while this sector contributes only 2 percent to national GDP.
Water management institutions and policies have highlighted that there has been strong progress in improving water policies and institutions, but that within agricultural programmes there is a lack of synergy among participants in rural development (IFPRI 2010). Countries have in place some governance structures for managing irrigation, but all countries have room for improvement regarding economic incentives and decentralised institutions, with a gap in community-based resource management groups.

**Population growth**

Population growth is straining already scarce resources. The population of MENA countries, estimated at 309 million in 2000, is expected to reach about 651 million by 2030, putting greater pressure on water infrastructure. Rising living standards and a sizeable young population pressing for enhanced economic growth, will further boost water demand.

Assuming no change in water availability, expected population growth for 2025 will dramatically increase water stress in the MENA region, as water availability per capita is expected to decrease in the range of 30 to 70 percent (an average of 42 percent) (Sowers et al. 2010).

The expected increase in water stress will affect most countries in the MENA region, but in groundwater-based countries (Algeria, Tunisia, Libya and Jordan), which already suffer from water stress, population growth will exacerbate the already existing water crisis. However, if we take into account the climate change factor, surface water-based countries (Morocco, Egypt, Syria and Lebanon) may also experience a dramatic reduction in surface flow if global warming affects precipitation in the intake areas of their rivers.

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Source: UN DESA (2013). World Population Prospects: The 2012 Revision

Figure 36. Total population projections until 2050 for selected analysed MENA countries (million, medium fertility)
Consequently, while population growth is expected to affect all countries in the MENA region, climate change could have a greater effect on countries in which supply is based on surface water.

Population growth is further exacerbated by regional problems such as wars and instability. The population growth rate of Jordan, for example, is considered to be one of the highest in the world. In addition, approximately 3 million Palestinian refugees settled in Jordan after the wars of 1948 and 1967, and half a million Jordanians returned after the Gulf War in 1990, with an additional half a million Iraqi citizens fleeing to Jordan after the Gulf War of 2003. The most recent political developments have brought an additional 619,000 Syrian refugees to Jordan (UNHCR data from August 2014). According to the Department of Statistics, the population of Jordan is doubling every 20 years, reaching 6 million in 2008 and potentially rising to 9.2 million by 2020. This increased population will put a large strain on already limited water resources and greatly increase urban sector water demand.

Rapid urbanisation

Since the mid-1980s, the MENA region has become more urban than rural. The urban setting is under extreme pressure in MENA today, because of a very rapid urbanisation rate over the past 10 years. Out of a population of 300 million, 170 million reside in urban areas and, according to UN projections, the MENA population will reach 430 million by 2020, of which 280 million are expected to live in urban areas. That is an urban population increase of over 65 percent, compared to the projected rural population increase of 8.5 percent.

Table 29. Urban and rural population projections in analysed MENA countries from 2000 to 2030

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Morocco</td>
<td>15.9</td>
<td>28.1</td>
<td>83%</td>
<td>12.4</td>
<td>11.3</td>
<td>-9%</td>
</tr>
<tr>
<td>Algeria</td>
<td>19.0</td>
<td>36.7</td>
<td>93%</td>
<td>12.5</td>
<td>12.7</td>
<td>2%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>6.3</td>
<td>10.5</td>
<td>67%</td>
<td>3.3</td>
<td>2.9</td>
<td>-12%</td>
</tr>
<tr>
<td>Egypt</td>
<td>31.0</td>
<td>60.1</td>
<td>94%</td>
<td>37.5</td>
<td>40.3</td>
<td>7%</td>
</tr>
<tr>
<td>Syria</td>
<td>8.8</td>
<td>19.4</td>
<td>120%</td>
<td>7.3</td>
<td>8.7</td>
<td>19%</td>
</tr>
<tr>
<td>Jordan</td>
<td>4.9</td>
<td>10.6</td>
<td>122%</td>
<td>1.7</td>
<td>2.2</td>
<td>29%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>3.1</td>
<td>4.4</td>
<td>42%</td>
<td>0.4</td>
<td>0.3</td>
<td>-25%</td>
</tr>
<tr>
<td>Libya</td>
<td>4.6</td>
<td>7.8</td>
<td>69%</td>
<td>0.6</td>
<td>0.7</td>
<td>17%</td>
</tr>
</tbody>
</table>
Compared with other developing countries, this rate of urbanisation comes just after that of Latin America. The MENA region has seen an average annual urban growth rate of 4 percent in the past two decades. The urban share of the total population grew from 48 percent in 1980 to close to 60 percent in 2000, and it was expected to exceed 70 percent by 2015 (against an average of 54 percent for all developing countries).


Figure 37. MENA region rural and urban population trends, 1950–2030

Figure 38. Rate of urbanisation in analysed MENA countries (1970–2000–2030 projection)
While geographical location, cultural aspects and climatic character (mostly arid) differ across the region, the various populations have developed and adopted a wide range of living and subsistence strategies. As a result, the urban population concentrates mainly along coastal or river shores and the region’s historical trade routes. The rural populations are either settled, with an agrarian economy, or unsettled, with a mobile livestock-keeping and trade-based economy.

Urbanisation will increase land-use alteration through increased urban encroachment on agricultural land, especially in coastal areas. This, in turn, will drastically change the water allocation among sectors, where the domestic sector will probably account for more than 20 percent of water use in 2050 against 11.4 percent in 2004. The climate change–induced rate of sea level rise could, however, reverse the prospect of densification along certain coasts, as at least 6 million people living in North Africa’s coastal urban (relying on tourism, industry, energy, transport, fisheries etc.), rural and agricultural land will be at risk by 2050 and will probably need to be resettled and provided with new livelihoods/opportunities or compensation for asset losses. This could heighten the risks of civil strife and conflict (Gregoire 2007).

The “urbanisation of poverty” accompanying the region’s rapid urbanisation is adding enormous pressure on cities to deliver infrastructure, services, housing and jobs to meet the growing demands and needs of the urban poor.

The consequence of a rapidly growing population, accentuated by a progressive shift from rural to urban living, is a growth in requirements in terms of both the quantity and quality of water resources, and their more intensive and comprehensive use. Greater population density may enable communities to invest in more efficient and cost-effective water management, but people who live in cities tend to use more water than those living in rural areas. Moreover, rapid urbanisation can hinder the development of adequate infrastructure, such as effective distribution methods, sewerage systems and regulatory mechanisms.

Pressure to focus more on water quality

An additional important driver outside the sector that is helping to narrow the practice gap has been political pressure on decision makers to focus more on water quality. Recent years have brought new pressure groups (in addition to large-scale farmers as one of the most influential lobby groups in creating pressure on water-related decisions), such as the tourist industry, which is interested in clean water resources and better water quality management in order to be able to benefit from tourism development.

Responses

Recognising these future challenges, most MENA countries have identified a number of potential actions that could be taken to reduce their vulnerability, particularly with respect to water and agricultural resources. These potential actions are summarised in Table 30.
Table 30. Adaptive measures taken by the governments of the selected MENA countries in the areas of water and agriculture

<table>
<thead>
<tr>
<th>Country</th>
<th>Measures</th>
</tr>
</thead>
</table>
| Algeria | • limited water allocation, based on the following priorities: drinking water, agriculture and industry; accelerated the construction of dams;  
          • started supplemental drilling programs and rehabilitate abandoned wells;  
          • Drawing up appropriate distribution plans (increased deep drilling in areas surrounding the cities of Algiers, Oran and Constantine).  
          • Regulating the consumption of water in cities at service stations, bath houses and public showers.  
          • Rehabilitating the water distribution network.  
          • Using non-conventional water sources: recycling of water by industry, and the use of wastewater.  
          • Protecting water resources through pollution and sanitary protection areas (vulnerability map).  
          • Regulating water withdrawal from groundwater sources. |
| Jordan  | • Activities concerning water quality, such as groundwater protection, including re-use of treated wastewater and the improvement of water quality (e.g. water treatment).  
          • Measures concerning domestic water supply, including water loss reduction and the introduction of water-saving technologies such as low-flow toilets and showers.  
          • Measures concerning agriculture: irrigation efficiency, e.g. through water-saving technologies; introduction of new crop varieties (cash crops); (micro) insurance solutions, e.g. in the case of crop shortfall; desalination of brackish water; re-use of treated wastewater; rainwater harvesting.  
          • Institutional adaptation activities: increased water metering; reform of water pricing; promotion of water saving through awareness campaigns. |
| Egypt   | • Maintaining storage at Aswan High Dam and creating other storage areas (e.g. Toshka and Quattara Depressions; Qaroun and Wadi El Natroun; and the coastal lakes of Manzala, Borroulas, Edko and Mariout).  
          • Increasing cultivated areas, especially at high elevations, in order to absorb surplus water.  
          • Storage in upstream lakes.  
          • Developing new water resources by:  
            − increasing Nile flows through Upper Nile conservation projects;  
            − the exploitation of deep groundwater reservoirs (Western Desert and Sinai Peninsula);  
            − rainwater harvesting on the coast and in the Red Sea area where flash floods normally have destructive effects;  
            − desalination, including of brackish groundwater;  
            − the recycling of treated wastewater (both domestic and industrial); and  
            − the increased re-use of land drainage water. |
| Morocco | • Establishing an inter-ministerial committee to combat the effects of drought (chaired by the prime minister).  
          • Increasing the pace of mobilisation of surface water and groundwater resources; huge infrastructure activities, including the construction of 59 large dams by 2030. |
and approximately 1,000 small dams; transferring water across the north–south axis to help alleviate water deficits.

- Improving irrigation by reducing water losses in some distribution networks and optimising consumption to the needs of different crops.
- Expanding the use of treated water for irrigation.
- Using brackish water for the irrigation of salinity-tolerant plant species in the Low Moulouya, including the demineralisation of brackish water at Bou Areg and Sahel.
- Desalinating seawater to supply drinking water to coastal cities along the Agadir–Tarfaya axis (start-up of the first units at Laâyoune and Boujdour; planned Tiznit-Sidi Ifni; Chtouka; Essaouira; Safi; El Jadida; Casablanca; etc).
- Protecting potable groundwater from pollution risks (improvement of legal enforcement) to ensure a steady supply to the cities of Tangier, Azilal and Sidi El Mokhtar.
- Introducing appropriate technologies for collecting and storing storm water in arid and semi-arid areas.
- Combating leaks in drinking water supply networks.
- Increasing the frequent restriction of water supply for irrigation.
- Encouraging water savings in agriculture (subsidies for drip irrigation systems).
- Increasing public awareness by undertaking campaigns on saving water.
- Accelerating the implementation of a programme for widespread access to drinking water in rural environments (PAGER).

| Tunisia | • Undertaking the restructuring of farmers’ bank debt.  
|         | • Importing and subsidising drilling products.  
|         | • Controlling the opening of forest land for grazing.  
|         | • Giving priority to drinking water.  
|         | • Restricting a certain number of summer crops.  
|         | • Public awareness campaigns.  

However, when it comes to progress made on the water-related adaptation policy framework, various assessments show that progress has tended to be limited to moderate in MENA countries. Among the selected countries, in Tunisia water is the focus of climate change–related issues. For the remainder, it would appear that policy makers have started to take the issue on board more recently. Nevertheless, the analysis suggests that overall concerns related to climate change and its effects on hydrology are tending to climb ever higher up national political agendas.

Transboundary water issues

Although transboundary water issues are not a focus area for WATER SUM Component 2, it should be noted that transboundary waters are critical to human development in the MENA region, simply because some 60 percent of MENA’s surface water is transboundary,
with important rivers passing through several countries, along with shared groundwater and aquifers. The MENA region has the world’s highest dependency on international water bodies. In addition, some of the world’s major international aquifers are to be found in the region.

Shared aquifers in the region include the Nubian Sandstone Aquifer (Chad, Egypt, Libya and Sudan), the North Western Sahara Aquifer System (Algeria, Libya and Tunisia), the Disi Aquifer (Jordan and Saudi Arabia), Rum-Saq Aquifer (Jordan and Saudi Arabia), the Great Oriental Erq Aquifer (Algeria and Tunisia) and Al-Kabeer Al-Janoubi (Lebanon and Syria). Countries that have a sizeable share of water resources coming from other countries\(^5\) include Egypt (a water dependency ratio of 96.86 according to the FAO AQUASTAT database); Syria (a water dependency ratio of 72.36); and to some extent Jordan (a water dependency ratio of 27.36). These countries are affected by decisions made upstream or elsewhere in the aquifer.

Regional water-sharing agreements are not well defined, or lack enforcement, and are also far from equitable, reflecting asymmetrical power and military capabilities (Grover et al. 2010). While some form of project-related arrangements exist in a number of the above-mentioned aquifers (including the Nubian Sandstone Aquifer and the North Western Sahara Aquifer System), they deal largely with monitoring and the exchange of information established under external project support. These arrangements are generally not inclusive in their scope and do not deal with optimisation or planning, nor do they have at their core established principles of international water law, such as equitable and reasonable utilisation and the obligation not to cause significant harm.

The lack of international agreements reflects, in large part, the weak political and multilateral engagement among the countries sharing the water. In the absence of agreements to allocate water, unilateral actions are perfectly rational. Most countries plan large water-related investments at the national level. The countries that have had the financing available to make these investments are, largely, the countries that have had stronger economies and greater political and military clout. Outdated or unrealistic policies of food self-sufficiency continue to drive these investments in the MENA region (Belloumi and Matoussi 2008).

**Summary**

*Water resources are overexploited and the situation will probably worsen in the future.*

Most of the region is classified as arid or semi-arid, and water is a scarce resource. Some 126.5 billion m\(^3\) of total renewable water can be mobilised annually in the eight analysed countries, which means that total water demand currently exceeds naturally available water supplies by almost 20 percent. Moreover, the quantity of water available varies considerably among MENA countries (from 113 m\(^3\)/inhabitant/year in Libya and 129 m\(^3\)/inhabitant/year in Jordan to 933 m\(^3\)/inhabitant/year in Lebanon), but is still below the 1,000 m\(^3\)/inhabitant/year threshold in all analysed countries. Average water availability per capita has shrunk dramatically in the last few decades (from an average of 2,925 m\(^3\)

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5 From among the countries covered by the present study.
per year in 1962 to 1,179.6 m³ in 1992, and to an alarming 743.5 m³ in 2011) as a result of high population pressure, lower rainfall and higher evaporation due to climate change, overexploitation, poor water management and other issues. Current overall annual water demand in the analysed countries is 102 billion m³, and it is projected to reach 160 billion m³ by 2050 (under an average climate scenario). Consequently, unmet demand (currently 6.6 billion m³) will increase more than tenfold, to 65.5 billion m³, endangering Egypt, Morocco and Syria the most. Thus, the threat of an imbalance between water demand and supply in the MENA region is real, although significant progress has been made through government efforts and the financial backing of international organisations.

In order to meet escalating demand, MENA countries rely on both conventional water resources (surface water and groundwater) and non-conventional resources (desalinated water, treated wastewater, irrigation drainage water, and water harvesting). From among the analysed countries, Jordan, Morocco and Syria depend more heavily on groundwater. Today’s unmet demands are met primarily by unsustainably mining fossil groundwater reserves and partially by increasing water supplies through desalination. As a result, the water table has fallen strongly in recent years, with the salinisation of some (mainly coastal) groundwater, particularly in North African countries.

The main weaknesses of water systems in the analysed countries are outlined below:

- In general, the network of water pipes is outdated and undersized and in serious need of rehabilitation, reinforcement, repair and maintenance. **An enormous amount of the water produced is non-revenue water**, lost through network breakdowns, leakages and illegal consumption. The rates of systemic water loss from the municipal sector are excessive (estimates in Jordan, for example, of up to 70 percent, and 51 percent in Algiers, compared with 7 to 20 percent in Europe), due to a high level of leakages in the water supply network.

- **Wastewater infrastructure is outdated and in chronic need of maintenance.** Although wastewater treatment and re-use have been promulgated as high-priority policies, especially in the most water scarce countries, additional efforts are needed to establish efficient re-use systems (water pricing reforms, infrastructure upgrading, awareness raising etc.).

- The use of water per sector is inefficient, with **high water allocations to agriculture** (84 percent of overall withdrawal on average in the analysed countries; and over 80 percent in Egypt, Libya, Morocco, Tunisia and Syria); for municipal purposes (10 percent on average); and to industry (6 percent on average). Algeria, Jordan and Lebanon have more balanced water usage, with nearly one-third of overall water used for municipal purposes. As a result, prices for municipal use are high, subsidising agricultural water use (as is the case in Jordan).

- **The pricing of water is non-efficient**, which is followed by a mismatch between water intensity rates and production and value rankings. In many cases, the coverage and monitoring of water meters is inadequate.

- **Adequate water conservation programmes and government subsidies to encourage conservation are limited or lacking.**

- **The product structure in agriculture is inappropriate** throughout the region, including the growing of water-intensive crops (such as citrus fruits) for export.
• Political instability in the region has also exacerbated water scarcity issues, raising new alarms over water scarcity.

Sixty percent of MENA’s surface water is transboundary. From among the analysed countries, those with a sizeable share of water resources coming from other countries include Egypt (a water dependency ratio of 96.86 according the FAO AQUASTAT database); Syria (a water dependency ratio 72.36); and to some extent Jordan (a water dependency ratio of 27.36). Regional water-sharing agreements are not well defined or lack enforcement, and are also far from equitable, reflecting asymmetrical power and military capabilities.

Another important issue is the deterioration of water quality, which is closely linked to water scarcity. Water quality is often at the lower limit of the existing standards, while the degradation of water resources in the region is high. The high demand for the limited water supply often leads to decreasing water quality, both for domestic use, through an intermittent water supply provided to elevated tanks; and for agriculture, because of increasing water salinity caused by groundwater overexploitation. Moreover, the rapid growth of the industrial sector often results in discharges of untreated water into natural water bodies. Today, the cost of the environmental degradation of water forms a significant part of GDP: almost 1.2 percent in Jordan and Morocco; and one percent in Egypt and Lebanon.

The recognition of the political importance of water seems to be improving in the region, and water is more and more seen as a priority area among the governments. This has been the result of an increase in education and awareness levels among the population, which continue to improve together with progress in socioeconomic conditions and the strengthening of civil society. However, it has also been due to the scarcity of the resource, the threat of climate change, the growing competition for water among various users, and the increasing investments in water infrastructure.

There has been notable progress at the level of institutions and governance approaches in the region. The reform of water policies, national water plans and financial approaches are the major factors in this regard. All of the analysed countries, with the exception of Egypt, have single water acts. The strategic framework is also comprehensive: except for Algeria (where a water strategy is still under preparation), all of the analysed countries have developed either a long-term national water strategy or a national water master plan, and some countries have issued both documents. The majority of the analysed countries developed their water sector strategic and action documents using the IWRM approach, and with well-designed horizontal and vertical coordination. Developed in close cooperation with international aid agencies, those documents form a stable basis for national initiatives and projects in the water sector.

The institutional setting in the water sector in the analysed countries is largely centralised and managed mostly at the national level with little local stakeholder or civil society participation, resulting in ineffective, fragmented structures, with the ministry in charge on the top of the decision-making pyramid and a clear hierarchy in the water sector. The ministry assumes ultimate responsibility for the country’s water sector. Even in countries where responsibilities are largely decentralised, the true devolution of powers has not been achieved. Responsibilities are decentralised, but corresponding powers and resources are not transferred. The local representative of the state (governor,
wali, prefect etc.) always has more power than the municipal leaders. Moreover, the governor, who represents the central authorities but is more aware of local realities, must often follow the instructions of central ministerial services. This is clearly the situation in Algeria, Morocco, Jordan and Tunisia, and to a lesser extent in Egypt, where large powers are concentrated in the hands of some governors.

However, the process of decentralisation seems to be progressing, with river basin organisations, water boards and regional water entities (river basin agencies in Algeria and Morocco; regional water establishments in Lebanon; CRDAs in Tunisia), being either established or improved. Egypt, Jordan, Lebanon and Morocco seem to be more advanced than other countries, reflecting modern water principles in national legislation. However, coordination between different water-related institutions is a major water governance issue. Rivalries between water institutions are common, and the responsibilities of each body are not always clearly established. Efforts have been targeted to improving the accountability of water sector operators and institutions, and the use of economic instruments has spread throughout the region. The same applies to progress in water demand management and water conservation practices.

The implementation of water policies has shown modest levels of cross-sectoral coordination, with ineffective permanent structures or institutions. The reasons are manifold and include, among others, overlapping responsibilities among sectors; uncoordinated plans of action; alack of incentives for coordination; power politics; alack of transparency and fear of exposure; and a lack of synchronisation. Various levels of institutional fragmentation and overlapping responsibilities do exist, often inhibiting effective IWRM. Planning and management are separate from budgeting processes. The enforcement of laws, the implementation of water pricing reforms and water governance–related issues are still challenging. Most efforts have failed due to inadequate compliance or poor enforcement.

When comparing the analysed countries with respect to overall water government capacity, it can be noted that some countries are more advanced. Jordan and Morocco both have high capacity for organisation in the water sector, demonstrated through both high policy and legal improvements, as well as the inclusion of all relevant government organisations, encompassing not only those in the water sector but also those in the closely related sectors of agriculture and the environment. The division of power allows the Jordan Valley, Jordan’s primary and productive agricultural region, to develop and use water differently than the cities and surrounding desert areas. A major concern is still the shortage of trained and competent personnel to serve as local water authorities. High capacity is evident for infrastructure development, operation and maintenance in both countries.

Despite the recognition of several positive trends and tendencies within the analysed countries, many challenges remain. The water sector’s financing gap represents one of the main shortcomings in implementing water plans/strategies. The water sector, predominantly publicly owned and with little private sector involvement, has funding shortages. A significant proportion of financial support from donors through loans and grants still covers the largest part of infrastructure investments. Cost recovery is generally low, impacting the financial sustainability of water services.

Water scarcity has physical and socioeconomic causes. Physical scarcity arises from climate conditions (water shortage) and unsustainable management (over-abstraction).
Urbanisation, population growth and climate change exacerbate the region’s natural water scarcity and widen the gap between supply and demand. Threats include natural variability, pollution and overexploitation.

Population growth will exacerbate the already existing water crisis. The population of MENA countries, estimated at 309 million in 2000, is expected to reach about 651 million by 2030, putting greater pressure on water infrastructure. Rising living standards and a sizeable young population pressing for enhanced economic growth, will further boost water demand. The expected increase in water stress related to population growth will affect most countries in the MENA region, but groundwater-based countries (Algeria, Tunisia, Libya and Jordan), which already suffer from water stress, will be most severely affected.

Climate change risks may worsen this situation to the point where social conflicts arise as water resources become scarcer and access to water more difficult. The overall trend of reduced precipitation, coupled with higher temperatures and rates of evaporation, will reduce agricultural and pastoral productivity. A rise in sea levels is also predicted to impact large areas in the MENA region. With growing demand for water, especially in cities, as well as growing shortages due to prolonged droughts, water will increasingly be allocated away from agricultural areas, causing rural hardship and accelerating migration to cities and abroad. Projected changes in climate will further exacerbate the existing challenges of providing adequate infrastructure, housing, employment and social services, heightening the potential for social, political and economic conflicts. More or less all the analysed countries are exposed to similar weaknesses that can deepen their vulnerability to climate change. They are over-dependent on water-sensitive economic sectors, such as agriculture, grazing, eco-tourism, aquaculture etc. The ecological base has already been harmed, particularly by water pollution, land degradation, desertification and the loss of biodiversity. Moreover, technological skills and financial and human resources are relatively limited for improving the water sector’s resilience to climate change.

Recognising these future challenges, most MENA countries have identified a number of potential actions that could be taken to reduce their vulnerability, particularly with respect to water and agricultural resources. However, when it comes to progress made in terms of the water-related adaptation policy framework, various assessments show that progress has tended to be limited to moderate in MENA countries.

The participation of NGOs and WUAs in water planning and implementation is increasing all over the MENA region, particularly in local water management consultations. Moreover, WUAs demonstrate the importance of joining local knowledge with modern information tools. Local community stakeholders and WUAs have been established throughout the region, with the aim of fostering the participation of farmers in the irrigation sector, with the roles and responsibilities of the government and the farmers evolving over time. However, stakeholder participation in water issues in the analysed countries is modest in terms of water planning, and inadequate with respect to the implementation of the plans. Although the participatory approach is relatively recognised through the implementation of WUAs, effective participation in water management and decision making remains weak, and in some countries the supporting legislation is lacking. Table 31 presents an overview of the current status and capacities of WUAs in the selected countries covered by this study.
Table 31. Current status and capacities of water users’ associations in the countries covered by the study

<table>
<thead>
<tr>
<th>Country</th>
<th>Stakeholder participation through WUAs introduced in 2005.</th>
<th>WUA participation encouraged (imposed) in small-scale intervention projects.</th>
<th>Participatory irrigation management mechanism from 2006 (monitoring committee for large-scale projects).</th>
<th>WUA development still in the initial stage due to low level of participation culture, lack of institutional and legal support, and lack of financial autonomy and technical capacity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>Stakeholder participation through WUAs introduced in 2005.</td>
<td>WUA participation encouraged (imposed) in small-scale intervention projects.</td>
<td>Participatory irrigation management mechanism from 2006 (monitoring committee for large-scale projects).</td>
<td>WUA development still in the initial stage due to low level of participation culture, lack of institutional and legal support, and lack of financial autonomy and technical capacity.</td>
</tr>
<tr>
<td>Egypt</td>
<td>Stakeholder participation through WUAs (water boards) at the branch canal level from 1988; recently extended to district level (still in the pilot phase).</td>
<td>WUAs formed as voluntary organisations of farmers and mainly responsible for irrigation and drainage.</td>
<td>WUA functioning in mature phase, although the institutional and legal environment is still being developed. A number of experiments and changes havetaken place in participatory planning at the local level. Participatory planning is still limited to rural areas and irrigation.</td>
<td>WUA functioning in mature phase, although the institutional and legal environment is still being developed. A number of experiments and changes havetaken place in participatory planning at the local level. Participatory planning is still limited to rural areas and irrigation.</td>
</tr>
<tr>
<td>Jordan</td>
<td>Limited influence of NGOs, although legal and institutional environment is favourable.</td>
<td>WUA formation dates back to 2003 (in the Jordan Valley); responsibilities include irrigation issues.</td>
<td>As WUAs are formed as an initiative of central institutions, as independent legal bodies they are still under the (informal) control of the JVA.</td>
<td>The transfer of tasks has recently been initiated, depending on the level of WUA development.</td>
</tr>
<tr>
<td>Lebanon</td>
<td>No experience in public participation in relation to irrigation and water issues. Establishment of WUAs is a very recent initiative (2012).</td>
<td>Legal and institutional conditions are favourable forpublic participation, but WUA functioning is still in the initial phase, with different experience (the level of inclusion in water planning and management variescase by case). Main obstacles include financial dependence on state funds and inability to collect fees, as well as low level of organisational and technical skills.</td>
<td>Legal and institutional conditions are favourable forpublic participation, but WUA functioning is still in the initial phase, with different experience (the level of inclusion in water planning and management variescase by case). Main obstacles include financial dependence on state funds and inability to collect fees, as well as low level of organisational and technical skills.</td>
<td></td>
</tr>
<tr>
<td>Morocco</td>
<td>Long tradition and a lot of experience in public participation in water issues at the local level.</td>
<td>Extended responsibilities of WUAs (overseeing service levels, charges and water allocation), mainly for irrigation, local water project planning and implementation, and local water conflict resolution.</td>
<td>Mature system of public participation in local water issues.</td>
<td>Mature system of public participation in local water issues.</td>
</tr>
<tr>
<td>Tunisia</td>
<td>Long tradition (from 1970s) and a lot of experience in public participation in water issues at the local level; WUAs are considered as crucial for water sector decentralisation.</td>
<td>WUAs established through government funding and given responsibility for the collection of water fees as well as service-related fees (infrastructure maintenance, investments etc.).</td>
<td>Currently have private legal status, formally independent, but in reality under local political pressure and dominance.</td>
<td>Currently have private legal status, formally independent, but in reality under local political pressure and dominance.</td>
</tr>
<tr>
<td></td>
<td>Mature and well-developed system of public participation in local water issues with issue of power over resources sometimes unclear.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The main constraint to the sustainable function of WUAs in the region is the only nominal support to decentralisation. This includes the lack of necessary incentives (policy and technical guidance, mechanisms and regulations), but also the low level of (local) capacities and local communities’ limited or non-existent accessibility to decision making.

A society’s adaptive capacity determines how scarcity affects it. Socioeconomic scarcity arises from a society’s economic inability to develop additional water resources, or social inability to adapt to the conditions imposed by physical scarcity.

Water governance must address all types of scarcity. It is essential to strengthen adaptive capacity — a complex function of a society’s infrastructure; wealth; economic structure; and physical, human and institutional resources.
Chapter IV  Indicator-based benchmarking of the MENA countries covered by this study with respect to water security

Background and rationale

Although there is no commonly accepted definition of water scarcity, Rijsbermann (2006) describes water scarcity as follows: “When an individual does not have access to safe and affordable water to satisfy her or his needs for drinking, washing or their livelihoods we call that person water insecure. When a large number of people in an area are water insecure for a significant period of time, then we can call that area water scarce.” “Water scarcity” in this sense depends on the “defined” and “satisfied” needs of people, and, if environmental water needs are taken into account, on the amount of water that “is made available” and “temporal and spatial scales” (Rijsberman 2006). White (2012) defines water scarcity as “the lack of access to adequate quantities of water for human and environmental uses”. However, the true nature of water scarcity is as complex as the physical flows and dynamics of the resource itself (Rijsberman 2006). Global freshwater scarcity induced by rapidly increasing demand requires solutions, thus representing a particular challenge for science and water governance (Hoekstra and Mekonnen 2012).

Mainly in the past two decades, different approaches have been concerned with the capturing of relevant aspects of pressures on water resources and with the characterisation and measurement of water scarcity. The description of water scarcity by using more or less complex indicators involves difficulties and uncertainties, thus there is no consensus on a standardised measurement (White 2012). The most common approaches are the Falkenmark Water Stress Index, the Social Water Stress Index (SWSI), the Water Resources Vulnerability Index (Criticality Ratio), Physical and Economic Scarcity Indicators and the Water Poverty Index. One particular weakness of current indicators is the focus on water withdrawal instead of actual water consumption. Furthermore, they do not include environmental flow requirements and temporal variation. Thus additional water scarcity indicators have been developed, including, for example, the Baseline Water Stress Index, per capita water footprint and Environmental Sustainability Index.

In the following chapters we use selected indicators to evaluate water security issues in the selected MENA countries (notably those covered by the present study), with the overall aim to list counties with respect to their appropriateness for WATER SUM Component 2 interventions.

Methodology

The overall goal of the analysis was to access and evaluate overall performance related to water security in selected MENA countries and to rank the countries covered by this study in relation to:
The results of the country ranking were intended to indicate the suitability of the analysed countries for possible interventions in the framework of the WATER SUM project. The higher overall ranking of a country means that that country faces more severe water scarcity, and that the planned official development assistance (ODA) would lead to more efficient, accountable and sustainable effects with less effort on the part of stakeholders.

Figure 39. Block scheme of the hierarchy of indicators for the analysis of suitability for WATER SUM intervention in relation to water security in selected MENA countries

To evaluate the countries covered by the present study in relation to the above-mentioned criteria, appropriate internationally recognised indicators have been selected, as follows:

- Indicators related to water scarcity:
  - Physical water stress
    - Water Resources Vulnerability Indices (Criticality Ratio)
    - Water Exploitation Index (WEI)
- Baseline Water Stress (BWS)
- Water Dependency Ratio (WDR)
- Total renewable water resources per capita (TRWR per capita)
- Water Stress Index (WSI)
  o Overall physical, social and environmental water scarcity:
    - Basic Human Needs (Water and Sanitation) (BHN W&S)
    - Water Scarcity Index (WSI)
    - Social Water Stress Index (SWSI)
    - Water Poverty Index (WPI)
    - Water footprint per capita
- Governance-related indicators:
  o Political stability and absence of violence/terrorism
  o Voice and accountability
  o Government effectiveness
  o Regulatory quality

A detailed description of the indicators is presented in Annex 1. The indicator values are collected from the sources indicated in Annex 3.

All countries covered by the present study (Algeria, Egypt, Jordan, Lebanon, Libya, Syria, Morocco and Tunisia) were evaluated. However, given the fact that, due to the current political situation and violent conflicts in Libya and Syria, the minimal conditions for the interventions planned in the WATER SUM project do not exist, the two countries were excluded from the ranking exercise.

Countries were ranked using the analytical hierarchical processes (AHP) method as a mathematical apparatus. The AHP is a structured multiple-criteria technique for organising and analysing complex decisions, developed by Thomas Saaty in the 1970s. Multi-criteria evaluation is a fundamental step in the rational decision-making process. The purpose of evaluation is to gain reliable information on the strengths, weaknesses, and overall utility of each option.

In order to undertake the multiple-criteria evaluation of the countries covered by this study (excluding Libya and Syria), a hierarchy of criteria was developed, as outlined above. The hierarchy of criteria includes criteria that will be taken into account during evaluation, ordered from the general to the specific. Criteria that are higher in the hierarchy are used to determine the importance (weights) of lower criteria. The lower criteria are the context for alternatives evaluation.

Lower criteria were determined as normalised values of indicators selected in the analysis (see above). All criteria under each top-level criterion were considered to have an equal weight.

The analysis was carried out using the AHP software “MakeItRational” (http://makeitrational.com/).
## Results

### Indicators related to water scarcity

The matrix of indicators related to water scarcity for eight of the countries covered by the study is presented in Table 32.

Table 32. Matrix of indicators related to water scarcity for eight countries covered by the present study
Ranking according to physical water stress

![Bar chart showing water stress ranking for various countries]

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total</th>
<th>WSI</th>
<th>TRWR per capita</th>
<th>WDR</th>
<th>BWS</th>
<th>WEI</th>
<th>Criticality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>56.44</td>
<td>10.21</td>
<td>13.43</td>
<td>0.62</td>
<td>12.49</td>
<td>13.51</td>
<td>8.17</td>
</tr>
<tr>
<td>Jordan</td>
<td>83.27</td>
<td>16.67</td>
<td>16.67</td>
<td>4.68</td>
<td>16.67</td>
<td>11.93</td>
<td>16.67</td>
</tr>
<tr>
<td>Egypt</td>
<td>66.28</td>
<td>5.91</td>
<td>5.55</td>
<td>10.07</td>
<td>4.83</td>
<td>19.07</td>
<td>16.67</td>
</tr>
<tr>
<td>Lebanon</td>
<td>31.25</td>
<td>2.67</td>
<td>1.26</td>
<td>0.14</td>
<td>16.49</td>
<td>5.84</td>
<td>4.85</td>
</tr>
<tr>
<td>Morocco</td>
<td>40.17</td>
<td>4.82</td>
<td>2.32</td>
<td>0.02</td>
<td>15.4</td>
<td>10.36</td>
<td>7.26</td>
</tr>
<tr>
<td>Tunisia</td>
<td>60.14</td>
<td>12.36</td>
<td>11.1</td>
<td>1.5</td>
<td>12.49</td>
<td>12.38</td>
<td>10.31</td>
</tr>
</tbody>
</table>
Figure 40. Comparison according to physical water stress

Ranking according to overall physical, social and environmental water scarcity
Figure 41. Comparison according to overall physical, social and environmental water scarcity

**Governance-related indicators**

The matrix of governance-related indicators for eight of the countries covered by this study is presented in Table 33.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Algeria</th>
<th>Egypt</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Libya</th>
<th>Morocco</th>
<th>Syria</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political stability and absence of violence/terrorism</td>
<td>-1.17</td>
<td>-1.62</td>
<td>-0.62</td>
<td>-1.69</td>
<td>-1.81</td>
<td>-0.50</td>
<td>-2.68</td>
<td>-0.91</td>
</tr>
<tr>
<td>Voice and accountability</td>
<td>-0.89</td>
<td>-1.04</td>
<td>-0.82</td>
<td>-0.44</td>
<td>-1.00</td>
<td>-0.72</td>
<td>-1.77</td>
<td>-0.11</td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>-0.60</td>
<td>-0.89</td>
<td>-0.11</td>
<td>-0.39</td>
<td>-1.50</td>
<td>-0.07</td>
<td>-1.34</td>
<td>0.00</td>
</tr>
<tr>
<td>Regulatory quality</td>
<td>-1.19</td>
<td>-0.70</td>
<td>0.11</td>
<td>-0.09</td>
<td>-1.83</td>
<td>-0.17</td>
<td>-1.61</td>
<td>-0.35</td>
</tr>
<tr>
<td>Rule of law</td>
<td>-0.68</td>
<td>-0.60</td>
<td>0.39</td>
<td>-0.78</td>
<td>-1.36</td>
<td>-0.25</td>
<td>-1.48</td>
<td>-0.20</td>
</tr>
<tr>
<td>Corruption control</td>
<td>-0.48</td>
<td>-0.60</td>
<td>0.09</td>
<td>-0.92</td>
<td>-1.52</td>
<td>-0.36</td>
<td>-1.24</td>
<td>-0.15</td>
</tr>
</tbody>
</table>

Source: World Bank; [www.govindicators.org](http://www.govindicators.org)
Data for 2013.
Range -2.5 / +2.5

Table 33. Matrix of governance-related indicators for eight countries covered by the present study

*Ranking according to governance-related indicators*
<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total</th>
<th>Stability</th>
<th>Accountability</th>
<th>Effectiveness</th>
<th>Regulatory quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>65.01</td>
<td>16.62</td>
<td>16.94</td>
<td>19</td>
<td>12.55</td>
</tr>
<tr>
<td>Jordan</td>
<td>89.97</td>
<td>23.5</td>
<td>17.57</td>
<td>23.9</td>
<td>25</td>
</tr>
<tr>
<td>Egypt</td>
<td>59.61</td>
<td>11</td>
<td>15.27</td>
<td>16.1</td>
<td>17.24</td>
</tr>
<tr>
<td>Lebanon</td>
<td>75.86</td>
<td>10.12</td>
<td>21.55</td>
<td>21.1</td>
<td>23.08</td>
</tr>
<tr>
<td>Morocco</td>
<td>90.24</td>
<td>25</td>
<td>18.82</td>
<td>24.3</td>
<td>22.32</td>
</tr>
<tr>
<td>Tunisia</td>
<td>90.47</td>
<td>19.88</td>
<td>25</td>
<td>25</td>
<td>20.59</td>
</tr>
</tbody>
</table>

Figure 42. Comparison according to government performance
Overall benchmarking

Ranking according to the suitability of selected MENA countries for WATER SUM project intervention in relation to water security

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total</th>
<th>Government performance</th>
<th>Overall physical, so</th>
<th>Physical water stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>62.58</td>
<td>21.47</td>
<td>21.43</td>
<td>19.48</td>
</tr>
<tr>
<td>Jordan</td>
<td>81.75</td>
<td>29.99</td>
<td>24.01</td>
<td>27.78</td>
</tr>
<tr>
<td>Egypt</td>
<td>59.02</td>
<td>19.87</td>
<td>10.65</td>
<td>22.09</td>
</tr>
<tr>
<td>Lebanon</td>
<td>55.78</td>
<td>25.29</td>
<td>20.08</td>
<td>10.42</td>
</tr>
<tr>
<td>Morocco</td>
<td>69.71</td>
<td>30.08</td>
<td>26.24</td>
<td>13.39</td>
</tr>
<tr>
<td>Tunisia</td>
<td>78.68</td>
<td>30.16</td>
<td>26.48</td>
<td>20.05</td>
</tr>
</tbody>
</table>
Summary

The MENA countries covered by this analysis (excluding Libya and Syria) were evaluated with respect to their performance related to water security. The evaluation was based on a set of internationally recognised indicators (used as criteria in the multiple-criteria analysis), grouped into three contextual groups: (1) physical water stress; (2) overall physical, social and environmental water scarcity; and (3) government performance. Each contextual group encompassed a separate set of indicators, as shown in Figure 39. The analysis was carried out based on the assumption that the higher overall ranking of the country means that the selected country faces more severe water scarcity issues and that the planned ODA would bring more efficient, accountable and sustainable effects with less effort on the part of stakeholders.

The results of multiple-criteria analysis are used to indicate the overall rank and specific ranking of countries (with respect to each contextual group). The analysis indicates that Jordan is the most suitable country of the six countries analysed for WATER SUM Component 2 project interventions in relation to local water security, with a total score of 81.75. The higher rank of Jordan can be attributed to the higher score for the physical water stress indicators. Tunisia was ranked second (with a total of 76.68) and Morocco third (with a total of 69.71), both being particularly exposed to overall physical, social and environmental water scarcity. All three countries have a higher ranking in terms of government performance than the other ranked countries, which indicates their relative political stability and accountability, and the quality and effectiveness of the legal basis. Other evaluated countries had the following total scores: Algeria 62.58; Egypt 58.62; and Lebanon 55.78.
Chapter V  Assessing local water security status

Local water security rapid assessment

Rapid appraisal has been used as a method to understand communities’ own perceptions of their priority needs. It is a process whereby key information on a municipality is collected as quickly as possible, with the participation of key stakeholders. It can be used as a tool for formulating joint action plans between communities and service planners and managers. It can also be used to complement quantitative methods of assessing needs by providing a deeper qualitative understanding of socio-cultural perspectives. Information is collected by three related means — observation in the field, discussion with key informants, and checking with existing reports and data. To this end, the research team visited the region in March and April 2015. Selected data and information were collected on:

- water management challenges faced in the area (including geography, climate, hydrology and hydrogeology, and socioeconomic characteristics);
- water-related drivers and challenges (including water use and demand, vulnerability to extreme hydrological events and climate change, land and water quality degradation); and
- the “governing” dimension of the issue (including stakeholder mapping and an analysis of power and interests, public participation and stakeholder involvement issues).

On the basis of the information collected, local experts and the project team undertook the provisional identification of problems and drew conclusions. Table 34 provides a summary of local water security rapid assessment results for selected municipalities in four countries: Jordan, Egypt, Tunisia and Morocco.
Table 34. Summary of the local water security rapid assessment for Jordan, Egypt, Tunisia and Morocco

<table>
<thead>
<tr>
<th>Municipality of Greater Jerash</th>
<th>Total area km²</th>
<th>Population</th>
<th>Specific problems identified related to water security</th>
<th>Competing uses of natural resources</th>
<th>Degradation of natural resources</th>
</tr>
</thead>
</table>
|                                | 108.5          | 81,000 (municipality); 45,000 (city) | - Increasing demand  
- Irregularity of water services  
- Competition among different sectors  
- Lack of public participation in planning  
- Fragmentation of institutions | - Meeting demand of different sectors  
- Compromise between livelihoods, food security and tourism  
- Rapid urbanisation at the expense of agricultural land  
- Overexploitation of natural resources, mainly groundwater | - Overexploitation of groundwater resources through high number of illegal wells |

| Municipality of Al Karak | 765 | 68,810 (municipality); 20,000 (city) | - Over-pumping from groundwater wells  
- Neglected and poor protection of springs  
- Poor infrastructure for water and wastewater  
- Institutional fragmentation  
- Increasing water demand | - Competition between agricultural and domestic demand | - Overexploitation of groundwater |

| Municipality of Greater Al-Salt | 72 | 97,000 | - Shortage of water resources  
- Low coverage with sewerage network  
- High water losses from network and low water-use efficiency  
- Illegal use of water | - Competition between agricultural, tourism and domestic demand | - |

| Municipality of Allan | 3.8 | 12,000 | - Limited water supply, as water is not sufficient to meet all demand  
- Over-pumping of groundwater  
- Accessibility to irrigation water  
- Low rate of households connected to improved sanitation  
- Spring depletion and contamination  
- High water losses due to old network and illegal use | - No significant competition | - Heavy pollution of springs |

| Municipality of Medenine | 55 | 61,000 | - Scarce surface water  
- Overexploitation of groundwater  
- Low or lacking intra-sectoral integration in water security issues  
- Low coverage of sewerage network and low efficiency of water re-use  
- Low level of awareness of water saving, harvesting and re-use | - Competition over groundwater resources between two main sectors: municipal and agricultural water use | - Threaten of salinisation of groundwater resources |
<table>
<thead>
<tr>
<th>Delegation of Sajnene</th>
<th>609</th>
<th>43,482</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Difficult access to safe drinking water for rural population, causing underdevelopment and high poverty rate in rural areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Waste of water resources from natural mountain sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Bad management of water for irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Discharge of sewage into river without treatment, causing water pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Doubtful choice of wastewater collection and treatment system in urban area; traditional sanitation fits better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Environmental pollution of surface water and groundwater</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delegation of Mornag</th>
<th>397</th>
<th>58,069</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Overexploitation of groundwater table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pollution of recipient water body (Mediterranean Sea) by wastewater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Bad management of irrigation water use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Strong competition for surface water and groundwater between municipal and irrigation uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Environmental pollution of surface water and groundwater</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Greater Alexandria</th>
<th>2,680</th>
<th>4,281,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increase in demand due to population growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Impact of climate change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High water leakages and high level of unaccounted-for water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- High water consumption per capita</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Seawater intrusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Surface water and groundwater quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Beaches and lake pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Competition between agricultural and urban water use, particularly over the water of Tarat ul Mahmoudia canal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Alexandria’s share of water depends on upstream water usage, and any excess use of water upstream will have an impact on Alexandria’s share of water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Water contamination due to open discharge of partially treated or untreated wastewater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Groundwater pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Extensive pollution of Lake Mariout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Severe seawater intrusion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15th May City</th>
<th>49.5</th>
<th>200,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>- High rate of water consumption per capita</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Use of freshwater for irrigation and industrial purposes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Rise in groundwater level affecting the bearing capacity of soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- No significant competition over water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Municipality of Essaouira</th>
<th>90</th>
<th>69,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Climate impact on water quantity and quality, including irregular rainfall and climate variability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Changed patterns in water use, including greater demand in agricultural and tourism sectors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Overexploitation of groundwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Seawater intrusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Operation of wastewater treatment plants (sludge accumulation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low rate of wastewater re-use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Institutional fragmentation of the water sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Competition between drinking water supply and water for industry and agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Overexploitation of groundwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipality of Tata</td>
<td>50</td>
<td>15,200</td>
</tr>
<tr>
<td>----------------------</td>
<td>----</td>
<td>--------</td>
</tr>
<tr>
<td>- Limited sustainable water resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Changed patterns in water use, including higher demand for municipal and agricultural water use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Climate impact on water quantity and quality, including irregular rainfall and climate variability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low staff capacity in the water sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low efficiency of the drinking water network, including high non-revenue water rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Institutional fragmentation of the water sector, including low level of public participation in water issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Competition between drinking water supply and water for agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- No data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Municipality of Oujda</th>
<th>600</th>
<th>401,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Overexploitation of groundwater resources (Bounaim-Tafna basin)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transboundary water disputes over the Bounaim-Tafna basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Deterioration in water quality in Jabel Hamra aquifer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Leakage and water losses in drinking water network</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Competition over freshwater. Since 2004, Algeria has increased groundwater drilling to meet drinking water needs in the Bounaim basin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pollution of groundwater in the Jabel Hamra aquifer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Municipality of Chefchaouen</th>
<th>4,350</th>
<th>35,700</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Socioeconomic development that creates a major change in water needs, mainly for municipal water supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Climate change, coupled with adverse geological and geomorphological conditions, impact the precariousness of hydrological regimes, influencing the mobilisation and development of water resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The area is prone to torrential flooding, erosion and landslides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Climate change may increase the risks of natural disasters, especially droughts and torrential floods, that may lead to water shortages and pollution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low technical efficiency of water supply network</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low rate of connection to piped water in rural areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Changed patterns in water use, including greater demand for municipal and agricultural water use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low staff capacity in the water sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- No competition over water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Erosion and landslides</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The detailed results of the rapid appraisal in selected municipalities are presented in Annex 1.
Methodology for local water security planning

Introduction

When assessing water security in a particular location, it is advised to complete two steps: 1) assess the current status of water security; and 2) create a plan. When deciding how to both assess the current status and select the most appropriate water plan for water security, the factors below should be considered:

- **Scope.** Ideally, the assessment and planning strategy should consider a broad spectrum of issues and should consolidate that information so that it is understandable and usable. When designing the Canadian Water Sustainability Index (CWSI), the Policy Research Initiative (2007) described how limiting its index to physical measures of quality and quantity would exclude many socioeconomic and municipal service concerns relevant to communities, and would go against the integrated nature of water resources. At the other end of the spectrum, if the Policy Research Initiative tried to capture too much information, the assessment would become too complex and create problems in meeting extensive (and perhaps excessive) data requirements.

- **Scale.** Scale should always be an important factor when determining which method is most applicable. It is highly likely that most locations are affected by upstream management decisions and uses. The question therefore arises as to whether to take the entire basin or the geographical jurisdiction into consideration when assessing water security. Perhaps the best approach is to gather data for certain indicators at the river basin (or aquifer) scale, while remaining indicators that measure community-specific elements should be based on community-level data, as suggested in the CWSI (Policy Research Initiative 2007a).

- **Applicability.** How well will the assessment apply to a range of communities? Ideally, the assessment should be sufficiently generic to be applied in all communities, yet specific enough to have meaning (Policy Research Initiative 2007a). Certain measurements, such as fish population and ecosystem health, may not be applicable for a community that relies entirely on groundwater.

- **Data availability.** Another limitation that could gauge the effectiveness of a water security assessment method is the availability and accessibility of data. It may not be possible to complete parts of the assessment, which may be deemed crucial to an understanding of the water system, due to a lack of data availability and accessibility.

- **Financial constraints.** How much money is available to perform this assessment and plan? Are there sufficient financial resources to repeat the assessment/carry out the plan?

We have selected two methodologies for the assessment of water security and four methodologies for the management of water security, which we describe in detail below. We then offer our recommendations for both an assessment and a planning strategy for water security for multiple municipalities.
Methodologies for assessing the current status of water security

There are a variety of indices that can be used to assess water security, including frameworks such as the Asian Water Development Framework for Assessing National Water Security and the methodology from the Water Footprint Network. For the purposes of this study, we analyse two approaches in detail: the Water Security Status Indicators (WSSI) assessment method and the Canadian Water Sustainability Index (CWSI).

Water Security Status Indicators

The WSSI assessment method is designed to 1) provide a framework to guide communities in selecting suitable/appropriate freshwater indicators; 2) integrate governance throughout the assessment process, first by incorporating stakeholders and second by incorporating the results of the assessment into water planning decisions and behaviour modifications; and 3) provide a path to integrate the assessment of both water quantity and water quality in terms of aquatic ecosystems and human health (Norman et al. 2013). The designers of the method caution that the WSSI method should be viewed as a starting point in assessing water security, since it does not include future risk (Dunn et al. 2012).

The designers of the WSSI method have described what makes their assessment method innovative: 1) It was developed in cooperation with end users (which made the design of the assessment method more user friendly). 2) It was designed to be implemented at local level, meaning a small-scale watershed or sub-watershed. 3) It integrates variables within the contexts of both water quality and water quantity as they relate to aquatic ecosystems and human health. 4) It provides “concrete outputs for incorporation into water decision-making processes.” (Norman et al. 2013)

The WSSI method consists of seven steps (see Table 35). When selecting indicators, the WSSI designers suggest considering the following:

- WSSI indicators should be easy to understand, timely, relevant, reliable, consistent, credible, transparent and accurate.
- WSSI indicators should be comprehensive, integrative and accessible.
- The choice of indicators should reflect the water source (groundwater, surface water, or integrated — that is, both surface water and groundwater.
- Land-use activities and intensity may impact water quality and quantity.
- A number of agencies develop indicators for multiple scales (international, national, regional, provincial and local). How accessible are existing relevant indicators (e.g. will the developer share the index formula or calculator)? Can the indicators be adapted to suit your needs?
- Once the variables (i.e. the parameters to be assessed) have been selected, the standards against which they are to be compared also need to be chosen (local, provincial, national or international).
• There are overlaps between water quality and quantity in terms of aquatic ecosystem health and human health. Some indicators can be applied to more than one category.

• It is important to understand the scale for which an indicator was developed. Is the indicator of choice sensitive enough (will it yield meaningful results) to be used at the scale identified for the assessment?

• Indicators that incorporate economic valuation are emerging. Is it feasible to include economic considerations in the assessment method? (Dunn et al. 2012)

Table 35. Fundamental steps in applying the WSSI framework

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Define scope and scale of assessment</td>
</tr>
<tr>
<td>2</td>
<td>Identify stakeholders and assemble the assessment team</td>
</tr>
<tr>
<td>3</td>
<td>Visioning and goals</td>
</tr>
<tr>
<td></td>
<td>Water security objectives and targets</td>
</tr>
<tr>
<td>4</td>
<td>Prepare information required to assess water security status</td>
</tr>
<tr>
<td></td>
<td>Decide the timeframe of the assessment</td>
</tr>
<tr>
<td></td>
<td>Identify key water issues (which parameters need to be measured)</td>
</tr>
<tr>
<td></td>
<td>Identify data availability and accessibility</td>
</tr>
<tr>
<td></td>
<td>Identify prior (water-related) studies and access to information</td>
</tr>
<tr>
<td></td>
<td>Identify existing indicators</td>
</tr>
<tr>
<td>5</td>
<td>Analysing and reporting results</td>
</tr>
<tr>
<td>6</td>
<td>Risk assessment and back-casting: Status in relation to water security goals</td>
</tr>
<tr>
<td>7</td>
<td>Governance mechanisms to move towards water security</td>
</tr>
</tbody>
</table>

Source: Adapted from Dunn et al. (2012)

Strengths of the WSSI method

• One of the strengths of the WSSI method is its flexibility. The WSSI method does not present itself as prescriptive; instead, it provides a framework for choosing and implementing indicators as well as strengthening the utility and applicability of the indicator results, leading to “improved water management outcomes” (Dunn et al. 2012).

• Stakeholder inclusion is stressed as an important step in assessing a community’s water security using the WSSI method. The WSSI method suggests including those involved in monitoring water-related issues and land-use planning; decision makers; and stakeholders. The WSSI designers stress that all decision makers should be identified and included from the outset in order to ensure that information needs are successfully identified and included in the process (Dunn et al. 2012).

• The WSSI method was designed to be implemented at local level (Norman et al. 2013). Another feature was to provide “concrete outputs” that can be incorporated into water planning decision-making processes (ibid.). The index was also designed to assess the status of freshwater through water quantity and quality issues together, rather than separately.

• Another strength of the WSSI design is the development of visual heuristics to disseminate analysis results, making it easier for community members to interpret
the data. In this case, the WSSI method uses a “traffic light” assessment approach (Figure 44) combined with a map and/or a slider bar, where green means that the status of a community’s water is “good”, yellow means “fair” (work needs to be completed to reach water security, but it is within the range of meeting goals), and red means “poor” (major work is needed) (Norman et al. 2013).

![Figure 44. The WSSI “traffic light” approach](image)

Source: Norman et al. (2013)

**Weaknesses of the WSSI method**

- The WSSI method was designed for assessing water security in communities in Canada. According to one interpretation, the WSSI method has been designed using Western values, thus perhaps the values assessed through the indicators do not accurately reflect values in the MENA region. The dissemination and timeliness of the data have also been cited as a key issue in relation to effective assessment.

**The Canadian Water Sustainability Index**

In contrast to the WSSI, the Canadian Water Sustainability Index (CWSI) is less of a process and instead showcases results using a numerical score. The CWSI “integrates a range of water-related data and information into a series of indicators” (Policy Research Initiative 2007a). Each indicator is assigned a score ranging from 0 to 100, with a higher score meaning that the community is closer to having the ideal conditions for the said indicator. The 15 indicators (see Table 36) are grouped into five component scores, where each component score comprises the average score for the three indicators. The five component scores are then averaged to calculate the final CWSI score.

The CWSI was initially applied in six case study communities across Canada. Three communities were First Nations communities, and the other three were rural municipalities. Each community had a population of between 1,000 and 5,000.
Table 36. The Canadian Water Sustainability Index framework

<table>
<thead>
<tr>
<th>Component</th>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource</td>
<td>Availability</td>
<td>• The amount of renewable freshwater available per person.</td>
</tr>
<tr>
<td></td>
<td>Supply</td>
<td>• The vulnerability of the supply caused by seasonal variations and/or diminishing groundwater resources.</td>
</tr>
<tr>
<td></td>
<td>Demand</td>
<td>• The level of demand for water use based on water licence allocations.</td>
</tr>
<tr>
<td>Ecosystem</td>
<td>Stress</td>
<td>• The amount of water removed from the ecosystem.</td>
</tr>
<tr>
<td></td>
<td>Quality</td>
<td>• The Water Quality Index score for the protection of aquatic life.</td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>• Population trends for economically and culturally significant fish species.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Demand</td>
<td>• How long before the capacity of water and wastewater services is exceeded due to population growth.</td>
</tr>
<tr>
<td></td>
<td>Condition</td>
<td>• The physical condition of water mains and sewers as reflected by system losses.</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>• The level of wastewater treatment.</td>
</tr>
<tr>
<td>Human health</td>
<td>Access</td>
<td>• The amount of potable water accessible per person.</td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td>• The number of service disruption days per person.</td>
</tr>
<tr>
<td></td>
<td>Impact</td>
<td>• The number of waterborne illness incidents.</td>
</tr>
<tr>
<td>Capacity</td>
<td>Financial</td>
<td>• The financial capacity of the community to manage water resources and respond to local challenges.</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>• The human capacity of the community to manage water resources and address local water issues.</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td>• The level of training that water and wastewater operators have received.</td>
</tr>
</tbody>
</table>

**Strengths of the CWSI**

Within the context of the MENA region, the CWSI score is easily understandable by many stakeholders and can be used as a comparison between various municipalities. Many of its data requirements were available for the Canadian communities in the case study. The index was cited as adaptable, as it could be implemented by a diverse range of communities with “some minor modifications” (Policy Research Initiative 2007a). This was partially confirmed when the CWSI was used in Ahwaz County in south-western Iran with satisfactory results, despite “economic and ethical differences” with the index design (Attari, Mojahed, and Sarraf 2014).

The Policy Research Initiative researchers mentioned that communities were very receptive to the CWSI. The researchers reported that community participants found their indicator scores to be generally reflective of their community’s reality in relation to the focus of the relevant indicator. This was coupled, however, with concern about the accuracy of component and composite scores, given the gaps in data.

Communities in the initial case study examination identified that the results of the CWSI could be drawn on to inform planning activities related to water and wastewater infrastructure and help to demonstrate the need for research studies that would gather more information on water and wastewater infrastructure. Communities also identified other uses and applications for the index, including:

- informing land-use planning, particularly zoning for water-intensive industries;
• providing information for approaching governments for funding;
• using the CWSI as a communications tool to verify or discredit existing speculation in the community on a number of water issues, particularly quality and quantity;
• informing residents about the state of water well-being in their communities and comparisons with other communities across the country;
• marketing the community’s potential to prospective developers and industries, including water-intensive industries; and
• identifying areas for research (Policy Research Initiative 2007a).

Weaknesses of the CWSI

One of the major problems cited with respect to the application of the CWSI concerns the gaps in data availability for some of the components. To calculate the index, approximately 60 data pieces are required. Data gaps were consistently present for several components and indicators in the pilot study. Data were missing for Component 2: Ecosystem Health; for Indicator 4: Ecosystem Stress, data were only available for half the communities in the trial run; and no data existed for Indicator 5: Water Quality or Indicator 6: Native Fish. For Indicator 12: Waterborne Illness, specifically the incidence of waterborne illness in the community, data were also frequently unavailable. Another issue connected to the gathering of data were the differences between provincial government processes for managing and/or monitoring water and wastewater. The diverse governmental structures throughout the MENA region could make it difficult for communities to gather data on their own.

Researchers carrying out the case study also mentioned how the data-gathering process was very time consuming, “particularly when attempting to gather information from government departments” (Centre for Indigenous Environmental Resources and Morin 2006). However, according to the researchers this difficulty might have been due to the fact that governments were not required to provide the data, as well as the fact that many communities have limited financial and human resources available to perform additional tasks beyond their normal workload. Other steps in gathering data were also time consuming: the researchers estimated that a community might need to dedicate a full week to data gathering.

Finally, the CWSI, as currently constructed, was cited as “somewhat cumbersome” and requiring “a fair amount of interpretation to derive scores” (Policy Research Initiative 2007b).
Table 37. Strengths and weaknesses of water security assessment methods

<table>
<thead>
<tr>
<th>Name of assessment method</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Security Status Indicators (WSSI)</td>
<td>• Flexibility</td>
<td>• Designed using Western values</td>
</tr>
<tr>
<td></td>
<td>• Emphasis on stakeholder inclusion</td>
<td>• Does not include future risk</td>
</tr>
<tr>
<td></td>
<td>• Designed to be implemented on a local scale</td>
<td>• Need for dissemination and timeliness of data</td>
</tr>
<tr>
<td></td>
<td>• Easily interpreted data</td>
<td></td>
</tr>
<tr>
<td>Canadian Water Sustainability Index (CWSI)</td>
<td>• Easily understandable score</td>
<td>• Gaps in data availability</td>
</tr>
<tr>
<td></td>
<td>• Easier to compare municipalities</td>
<td>• Time consuming to gather data</td>
</tr>
<tr>
<td></td>
<td>• Buy-in of results from community</td>
<td>• “Somewhat cumbersome; requires a fair amount of interpretation to derive</td>
</tr>
<tr>
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Recommendation for a water security assessment method

Both assessment methods have strengths and weaknesses. When looking for an appropriate method for assessing water security in the context of this project, we therefore feel that the most sensible recommendation is to apply elements from both assessment methods. Given that multiple communities will be assessed in the project, it is important to have an assessment method that is easily translatable and comparable. This is one of the main strengths of the CWSI framework. The CWSI assessment score can be very easily understood by both practitioners and stakeholders. Moreover, it has already been implemented in the vicinity of the MENA region, having been used in Ahwaz County in south-western Iran with satisfactory results.

The CWSI appears to cover a broad spectrum of issues and yet presents information in an easily understandable manner. The scale of the CWSI assessment framework is also appropriate, as the CWSI focuses on assessing water security at the municipal level. The CWSI is also flexible enough within its structure to be able to be used in a range of municipalities throughout the MENA region. The biggest limitation of the CWSI, however, will be data availability. This was mentioned as a constraint in the vast majority of municipalities where the CWSI has been previously implemented. Perhaps financial constraints and the repeatability of this assessment will also become an issue, depending on financial and human resources.

Having said this, applying the steps in the WSSI assessment framework (Table 35) appears to be an excellent way to create local buy-in in the assessment process. Step 3 (Visioning and Goals and Water Security Objectives and Targets) and Step 6 (Risk Assessment and Back-Casting: Status in Relation to Water Security Goals), for example, would be especially relevant when putting the results of the CWSI in context. It is extremely important for any water security management framework to understand the dimensions and constraints of the water system in question. However, it is also critically important to put those assessment results into the context of how the results influence water security goals, and to elaborate on the risks that a particular entity might face in the future.
Methodologies for improving and maintaining water security

After selecting an appropriate method for assessing the current water security situation in the municipalities, the next logical step is to devise a plan for ensuring, improving and maintaining water security. Examples of methodologies include IWRM, the water–food–energy–climate nexus approach, and the ecosystems-based approach. Below, we present four methodologies that could be used, followed by a recommendation of a methodology that might be the most appropriate.

Community-based water resources management

Community-based water resources management (CBWRM) is a process that aims to achieve water security through a number of practical activities that both water users and local governments can engage with. The terms CBWRM and light IWRM are sometimes used interchangeably, and both are based on iterations of the IWRM concept (WaterAid 2012). In applying CBWRM, communities and local governments collectively identify threats to their water resources, nominating volunteers to monitor rainfall, groundwater levels, and demand for water and land use. Information from these measurements indicates whether threats such as drought or conflict over water access are likely to emerge. Communities periodically discuss these threats and take action to better manage them.

The idea behind CBWRM is a “bottom-up” approach. Instead of using the river basin as the unit of management, or being strictly managed at the national level, CBWRM stresses smaller, more manageable sub-catchment units. The CBWRM process also recognises that many communities may already have coping strategies and water-use rules, and rather than overlooking or replacing these with top-down, theoretical IWRM concepts, the CBWRM process focuses on strengthening these strategies and rules where appropriate.

Before carrying out CBWRM, the designers stress the importance of completing the following three steps:

1) Determine if CBWRM will add value. Is there a demand for strengthened water-use principles and risk-based planning from the community? The CBWRM approach may add value in situations where access is not equitable, where there are competing demands for water, where conflict emerges over access, where availability and quality fluctuate, where disaster events threaten supplies, and where community engagement with local and national institutions responsible for service provision must be strengthened.

2) With the communities, define the boundaries of the area where CBWRM will be implemented. This is more likely to be a manageable geographical area of population (e.g. a group of villages) rather than a hydrological river basin or catchment.

3) Identify all water users (WaterAid 2012).

Figure 45 shows the steps involved in the CBWRM framework approach:
The CBWRM approach has been implemented at national level in Ghana by the Community Water and Sanitation Agency (an independent agency created to facilitate the approach) and water and sanitation teams from each district administration (Sun, Asante and Berner 2010). Earlier, Ghana’s water supply was operated by the central government. Budget constraints, low revenues and shortfalls in operation and maintenance resulted in the insufficient expansion of water systems and a failure to meet rural water needs. To rectify this, Ghana implemented the Decentralisation Act in 1983, giving district assemblies greater responsibilities. This led to Ghana being one of the first countries to introduce a community-based approach to rural water supply on a large scale (Engel, Iskandarani and delPilarUseche 2005).

Sun, Asante and Berner (2010) found that the water and sanitation committees, or WATSANs, formed to manage water in Ghanaian communities, were more likely to function in communities where there were a number of functioning community-based organisations already present. Their research indicated that establishing more functional WATSANs was more difficult in communities with higher ethnic diversity. They also found a tendency towards higher satisfaction with drinking water quantity and quality in communities with WATSANs. However, the researchers also found some drawbacks with WATSANs, including the fact that the WATSANs had limited authority in choosing contractors to be in charge of establishing drinking water facilities, and that community members involved in the WATSANS had adequate opportunities to express dissatisfaction with the contractors’ work when problems were observed.
Strengths of CBWRM

- The Institute of Civil Engineers, Oxfam GB and WaterAid (2011) have cited CBWRM as a more realistic option for involving local water users, since the aim is to engage directly with community-based institutions and water user groups to enable them to play an active role in water resource planning from the start. Among the other listed benefits are the fact that CBWRM:
  
  o provides an opportunity for communities to engage in water resource planning with roles and responsibilities clearly defined alongside those of the regulating water authorities;
  
  o does not attempt to be a direct replacement for national IWRM plans;
  
  o encourages organisations that are predominately engaged in the provision of domestic water supply and sanitation services to consider productive water requirements when designing water supply systems; and
  
  o encourages practitioners who are responsible for designing and implementing water supply systems to consider the issue of water quantity as well as the issue of water quality (ibid.).

- The strategy can be considered cheap to carry out, especially since it relies on building upon previous local water planning structures and initiatives.

Weaknesses of CBWRM

- One of the limitations of CBWRM is its questionable ability to scale up local initiatives for the management of transboundary water resources. It cannot replace regional or national water plans (if they exist). The scale might also be too small for practical application in some municipalities. Along those lines, a lack of coordination between communities and programmes implementing CBWRM may be challenging for its success.

- It may prove difficult to evaluate the success of CBWRM, given its commitment to adhering and building upon local water management practices.

Light IWRM

The IWRM concept has been articulated and put into practice since at least the late 1980s, when most water management and development professionals agreed on the need for water management to be nested and coordinated within broader cross-sectoral management and development goals. This approach was formally enshrined in the 1992 Dublin Principles:

- Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

- Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.
Women play a central part in the provision, management and safeguarding of water.

Water has an economic value in all its competing uses and should be recognised as an economic good (WMO 1992).

Since that time, IWRM has become the most commonly used water resources planning framework worldwide. However, despite its global ubiquity, criticism of the IWRM approach abounds. One of the most common critiques is that IWRM’s focus on prescriptive, national and transnational solutions, such as the creation of river basin organisations or national water strategies, does not take local-level concerns or solutions sufficiently into consideration — although this is the precise scale at which most quotidian water planning and usage takes place. Indeed, the three countries in this study — Morocco, Egypt and Jordan — have existing IWRM strategies in place yet continue to face significant water insecurity. While there are certainly attenuating factors in each country, the fact remains that “classical” IWRM has not been sufficient, especially at the municipal level.

In response to some of the early critiques of IWRM, and acknowledging the fact that the greatest potential for improved water planning is often (initially, at least) found at the micro-watershed level, Moriarty and his colleagues at the IRC International Water and Sanitation Centre developed the concept of “light IWRM” (Moriarty et al. 2004). Light IWRM applies traditional IWRM principles and best practices in sub-sector projects and programmes, promoting bottom-up, multi-stakeholder planning and conflict resolution. Light IWRM is purported to be opportunistic, adaptive and problem-focused (Batchelor and Butterworth 2014). The intended outcome is a system of managing water resources that is developed incrementally over a number of years in response to real demand. It is, as a result, better adapted to the unique political economy of a given area, and can be scaled up to the national and transnational level where appropriate. One of the earliest light IWRM applications was the EMPOWERS project, undertaken in the MENA region between 2003 and 2007. This project sought to bring the integrated management principles of IWRM to the level of water users and water service providers in three governorates in Jordan, Egypt and Palestine (Moriarty et al. 2010). The EMPOWERS project and other light IWRM projects take a pragmatic approach to improved water governance, focusing on cultivating communication, information sharing, and negotiation between different water users, as well as integrating local knowledge and existing management programmes into their recommendations for future action. Indeed, in the case of the EMPOWERS project, the facilitators expressly did not attempt to create new institutions or structures but instead focused on strengthening the linkages and communication between existing ones (Moriarty et al. 2010). In this way, they actively sought to avoid generic solutions that may or may not have been appropriate at the local level in each particular country.

Light IWRM is an iterative approach that encourages the regular revisitation of project vision and goals, adjusting and improving them as needed in order to keep the process fixed in reality and adapted to stochastic circumstances. To this end, the EMPOWERS project employed scenario-building exercises as a way to get expert and non-expert stakeholders engaged in the uncomfortable uncertainty of making medium-term and long-term decisions against a backdrop of variability, complexity and a fundamentally unpredictable future. These scenario-building exercises were repeated throughout the
Another benefit of light IWRM is its pragmatism: instead of insisting on good governance practices, light IWRM accepts “good enough” governance outcomes that are appropriately context specific. Good enough governance means that interventions that we assume contribute to the ends of economic and political development “need to be questioned, prioritised, and made relevant to the conditions of individual countries. They need to be assessed in the light of historical evidence, sequence, and timing, and they should be selected carefully in terms of their contributions to particular ends such as poverty reduction and democracy” (Grindle 2007, p. 554). Reforms, when necessary, should be targeted towards existing institutions within the water sector instead of insisting on wholesale regime change. In many cases, it is not immediately possible or realistic to adopt a national water security strategy, given governance constraints; in other cases, a national strategy is already in place but there are problems with implementation. Light IWRM focuses on specific problems and works to make improvements within the existing governance context whenever possible. Good governance is undeniably important to long-term stability, but should not preclude incremental progress in the short to medium term.

Finally, while traditional IWRM insists on integration between sub-sectors such as water, energy production and food security, light IWRM makes the case that not all projects need to be integrated. Water managers should first consider if their project requires integrated management or if sole-sector management is more appropriate. Integration is indeed vital in some cases, but it is often comparatively slowmoving, requiring a high level of coordination, effort, funding and buy-in. Oftentimes smaller, municipal-level projects can be loosely coordinated with other sectors, but do not require full integration in order to get off the ground. Water managers should take advantage of these opportunities to test out pilot projects before committing to larger, more integrated proposals requiring considerably more time, energy and investment. Where appropriate, they can then be adapted, scaled and integrated with other “nexus” issues such as food and energy security, as well as with broader water departments such as water delivery and sanitation, which often operate independently.

In sum, IWRM has proved its worth and staying power in the world of water resources planning and security. However, it is clear that some modifications are in order. Light IWRM is an attempt to apply the principles of IWRM at the local level by addressing specific problems in an adaptive, iterative way that involves local stakeholders and governance institutions. Instead of top-down prescriptions, light IWRM seeks to develop locally appropriate solutions that can be revised and scaled as necessary and do not require extensive national or transnational buy-in prior to project testing and analysis. This is a potentially useful water security planning tool for the current REC project, since we are devising planning tools and methodologies appropriate for municipalities to use in order to improve their long-term water security. While national-level plans are important, planning at the local level requires a greater measure of flexibility and independence, which are key components of light IWRM.

**Strengths of light IWRM**

- It is well suited to local-level engagement and implementation.
• It is adaptive to a variety of on-the-ground situations.
• There are potential cost savings in devising and implementing small pilot projects before scaling up.
• The methodology does not necessarily require extensive integration with other sectors.
• The methodology focuses on specific targeted problems instead of larger all-inclusive initiatives.

**Weaknesses of light IWRM**

• It requires sustained local-level engagement and assistance.
• Because it is locally focused, it does not take into account national and transnational water issues that may affect the local watershed/aquifer.
• The term “integrated water resources management” has a negative connotation for many people around the world who have directly experienced IWRM project failures (Batchelor and Butterworth 2014), and who may be wary of engaging with a methodology that incorporates IWRM principles.

**Problem-driven iterative adaptation**

The concept of problem-driven iterative adaptation (PDIA) was first developed by scholars at the Harvard Kennedy School in conjunction with the Center for Global Development. It aims to improve governance reform initiatives that, to their detriment, often focus on the external type or make-up of policies or institutions while largely ignoring what these policies or institutions actually do. This focus on appearances is not limited to the water sector, and nor is the PDIA approach. While not explicitly a water governance tool, PDIA can assist in creating or reforming governance mechanisms or institutions in order to improve their responsiveness to local water needs. According to its authors, PDIA incorporates four core elements into its approach that can “create enhanced possibilities of success in an array of sectors and can be implemented in a variety of modalities and country contexts” (Andrews et al. 2012, p. 8). The four elements are:

• local solutions to local problems;
• the creation of an “authorising environment” for decision making that encourages experimentation and “positive deviance”, giving rise to:
• active, ongoing and experiential learning and the iterative feedback of lessons into new solutions, doing so by:
• engaging broad sets of agents to ensure that reforms are viable, legitimate and relevant — politically supportable and practically implementable/scalable.

The authors stress that PDIA is not a model or a method for doing development work. Rather, it is a set of principles to guide problem solving in a broad variety of sectors. Like light IWRM, PDIA is problem centred: solutions are derived later, based on individual context, instead of being plucked from a pre-existing list of best practices. Because PDIA is sector neutral it does not favour one intuitional structure over another and therefore can
be adapted to a variety of existing institutions, which is useful in this case study as each country has different water planning regimes currently in place. The PDIA approach does not require the homogenisation of water sectors across all municipalities and states; the principles enshrined within the approach could be employed in the development of appropriate water planning in each municipality.

The first principle is that any planning reform should aim to address specific locally defined problems, taking full account of their particular operating context. A focus on problem solving puts the burden on performance as opposed to compliance with externally prescribed methodologies or solutions (Andrews et al. 2012). Once problems are identified, they can be broken down and “de-institutionalised” in order to uncover root causes and begin the process of looking for better ways of achieving optimal results. The authors identify a few tools, such as the “5-whys” technique, which asks agents to identify a problem and then answer why it is a problem five times, forcing the agent to reflect on why the problem matters, and to whom (Andrews et al. 2012). This process has been shown to help pinpoint the underlying cause(s) of problems often left unexamined when the focus is on the presence or absence of a particular form of governance or regulation. For water insecure countries such as Jordan, Egypt and Morocco, there is a need to improve water governance at all levels. In order to improve the current system, a PDIA focus on interrogating the underlying causes of current governance deficiencies is a potentially useful first step.

The second core principle of the PDIA approach is the creation of an environment for decision making that encourages “positive deviance” and open experimentation. In an age of unprecedented climate variability and water scarcity, this principle is key to the adaptive planning of water resources at all levels. Given the complexity of the issues that these states face, it is unlikely that the best solution will present itself first, or that the solution will not need to be adapted as political, environmental and economic realities change. There must be sanctioned space for collaborative, iterative and locally driven experimentation. Taking a gradual approach to water resources planning is not only more likely to result in better long-term solutions, but is also far less expensive than imposing broad fixes imported from other contexts, which may or may not be appropriate or effective in all situations. The ability to deviate from the status quo in search of novel solutions is essential in complex and uncertain contexts where the problems and solutions are opaque and reformers may lack confidence in their ability to improve the situation. This requires system-wide mechanisms sanctioned and encouraged by the relevant authorising power, allowing non-linear processes of change that may at times produce idiosyncratic solutions. This space for trial and error, in combination with the first principle’s focus on problem-oriented solutions, is likely to increase the long-term appropriateness and robustness of the proffered solutions.

The third core principle imbeds this experimentation within active, ongoing and experiential learning feedback loops that facilitate the development of new or revised solutions when necessary. The importance of learning within PDIA is crucial to achieving optimal outcomes: one must try multiple combinations and continuously make small adjustments to the planning system in order to ensure that it remains useful during times of change. This iterative approach differs meaningfully from traditional monitoring and evaluation programmes that focus on compliance with a linear process, allowing for “lessons learned” only at the end of the project (Andrews et al. 2012). This approach
allows on-the-ground reality to rapidly shape the activities undertaken or the reforms implemented. There is no universal solution: hybrid approaches often end up being the most useful, but these cannot be identified or tested without a period of experimentation and learning. This dynamism mirrors dynamic systems such as water resources, which vary according to season, human withdrawals and climatic variability. In order to ensure future water security, the mechanisms in place must be able to adapt to changing conditions. By fostering a planning environment that embraces ongoing learning and adaptation, leaders at all levels will be able to better respond to future changes and challenges.

The fourth and final core principle of the PDIA framework is cultivating broad engagement for ensuring the viability, legitimacy and relevance of any solutions devised. The PDIA approach holds that change “primarily takes root when it involves broad sets of agents engaged together in designing and implementing locally relevant solutions to locally perceived problems” (Andrews et al. 2012, p. 16–17). The process of change and development hinges on the agency of the participants — diffusion demands broad support for change that often cannot be achieved by narrow, top-down engagement alone. Bottom-up approaches must be connected to leadership initiatives in order to craft local experiments and solutions to larger problems such as water security. This is especially relevant for the water sector: if there is no buy-in at the local level it is unlikely that the solutions devised at the state level will achieve the desired outcomes, since water is predominantly managed and used at the municipal level. Local solutions are crucial to managing local problems: it is far easier to scale up than scale down. As Whittle, Suhomlinova and Mueller contend, any kind of change requires “the involvement, interaction and conjoint activity of multiple actors” including “the more mundane and less prominent, but nevertheless essential, activities of ‘others’ in the institutional work associated with emergent institution-building” (2010, p. 553). Omitting these actors will lead to sub-optimal, often impractical, solutions, according to PDIA.

One example of the PDIA approach in action is within the World Bank–sponsored Pay and Performance good governance development project in Sierra Leone (Roseth and Srivastana 2013). The team began with short-term results-focused pilot initiatives. These were designed to help build confidence within the local civil service by demonstrating that progress was indeed possible in their context, and helped foster ownership over the results achieved. The short timespan of these projects also created quick feedback loops that helped both the civil servants and the World Bank project managers to rapidly learn what works and what does not in their given context, and to make adjustments for the next round. Structured team coaching throughout the implementation process was utilised, as were one-day strategic meetings between the leadership and team members, held at critical points throughout the initial phases of implementation in order to review what was happening and make swift course corrections where necessary (Roseth and Srivastana 2013). These ideas and processes are not revolutionary. However, after only 20 months of implementation, they had achieved several concrete results and, equally importantly, had strengthened inter-agency collaboration and trust. While not a water security project, this programme has potential relevance for those working within the water sector as well.
**Strengths of the PDIA approach**

- It is sector neutral and can apply within and outside the water sector.
- It fosters creative approaches to resource planning and there are no prescriptions for what solutions will work best.
- The focus is on actual performance, not meeting outside methodological criteria.
- The learning-by-doing approach means projects are easy to revise when things are not working.

**Weaknesses of the PDIA approach**

- There is a potential for redundancy/overlaps with others working on water planning, since PDIA does not require close coordination with other sectors or levels of government.
- It could be hard to integrate with restrictive donor-funded projects that require strict monitoring/evaluation.

**Ecosystem-based approach**

The ecosystem approach (EA) was first developed by the Convention on Biological Diversity (CBD) and adopted as the primary framework for action under the convention in 1995. Jordan, Egypt and Morocco have all ratified the convention and are parties to it. The EA is defined as “a strategy for the management of land, water and living resources that promotes conservation and sustainable use in an equitable way” (Smith and Maltby 2003). It is based on the application of appropriate scientific methodologies and adaptive management principles to planning and decision making at all levels. The EA acknowledges the dynamic, complex and non-linear nature of ecosystems and recognises that there is a lack of complete knowledge and understanding of ecosystem functioning. It attempts to ameliorate this stochasticity by pursuing flexible models that can work within a variety of development and planning scenarios. This approach does not specify any particular spatial scale, nor does it preclude other management approaches and can often be nested within such approaches. The scale of analysis and plan(s) chosen should be determined by the particular problem being addressed. The EA subscribes to the principle of subsidiarity, meaning that activities should be decentralised to the lowest appropriate level of governance whenever feasible. Implementation is also flexible and depends on the prevailing local, national, regional or global conditions. Given the variable and changing nature of ecosystems, the EA requires adaptive management strategies that promote learning by doing and incorporate mechanisms that allow strategies to evolve, based on changing conditions. This is potentially useful for managing water in regions with high levels of variability and scarcity, and ensures that water is placed in a larger, ecosystem-level context.

The EA comprises 12 complementary and interlinked principles that can be integrated as a whole or individually, depending on project needs. These principles are as follows:

- The objectives of the management of land, water and living resources are a matter of societal choices.
Management should be decentralised to the lowest appropriate level.

Ecosystem managers should consider the effects of their activities on adjacent and other ecosystems.

Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem management programme should reduce those market distortions that adversely affect biological diversity, align incentives to promote biodiversity conservation and sustainable use, and internalise costs and benefits in the given ecosystem to the extent feasible.

The conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Ecosystems must be managed within the limits of their functioning.

The EA should be undertaken at the appropriate spatial and temporal scales.

Recognising the varying temporal scales and lag effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.

Management must recognise that change is inevitable.

The EA should seek an appropriate balance between, and the integration of, conservation and the use of biological diversity.

The EA should consider all forms of relevant information, including scientific, indigenous and local knowledge, innovations and practices.

The EA should involve all relevant sectors of society and scientific disciplines.

These principles were formally endorsed by the CBD at the fifth meeting of the Conference of the Parties. In a review of EA case studies, the authors found that the most relevant principles are principles 1 (societal choice), 2 (decentralised management) and 12 (wide-ranging stakeholder engagement) (Smith and Maltby 2003). While policy makers and programme managers are encouraged to incorporate all 12 principles to ensure a broad ecosystems focus, not all are required in order for a project or piece of legislation to be considered ecosystem based.

While the majority of EA case studies focus on the implementation of these principles into national or regional biodiversity strategies, some countries have begun to incorporate the EA principles into policy instruments, planning processes and sectoral plans (Secretariat of the CBD 2004). The authors note that capacity building and sustainable financing are important for the success of this approach, because it relies on extensive, ongoing monitoring of project progress and the collection of resource, biophysical, social and economic information. Achieving this requires extensive human and monetary capital up front, although in the long term there can be savings in the form of improved ecosystem functioning requiring less human intervention and remediation in order to accomplish broader goals such as water security. While the full EA itself may be too costly and extensive to undertake at the municipal level, when making planning decisions community-based water conservation groups can certainly take on board some of the principles enumerated within the approach. The iterative learning-by-doing nature
of the approach is conducive to local-level project implementation, giving guidance on what factors should be addressed but providing the flexibility to change the project parameters as the situation evolves or new knowledge and information are added.

Acknowledging the complex and interrelated nature of water resources within the larger ecosystem is an important first step in analysing the trade-offs necessary to make local and national water security a reality. Water does not exist in isolation: it is inextricably tied to the health of the broader ecosystem in which it is situated. The EA makes these connections explicit and considers distinct sectors of the economy as part of a single system. In doing so, it attempts to blur the boundaries between sectors and encourages systems thinking, in which individual decisions at all levels are weighed and placed in the context of the larger whole. Clearly, this approach requires extensive and ongoing coordination between actors. In some cases, this level of coordination may not be possible or even desirable, so it is important to identify the particular problem and its attributes prior to determining if the EA is likely to provide the best possible avenue for success.

One example of a project that employs the EA is the Jordan Valley Permaculture (JVP) project. The JVP is a pilot project aimed at rehabilitating 4 ha of non-productive, highly degraded farmland in the Jordan River Valley using sustainable, low-cost permaculture methodologies to improve the quantity and quality of agricultural production and to improve the livelihoods and living conditions of the local population (ProAct Network, 2013). A pilot farm was established and rainwater harvesting swales and drip irrigation systems were installed to improve the gathering and dissemination of irrigation water on the farm. Water needs were reduced by almost 40 percent due to efficient water storage and harvesting. Greater awareness among community members with regard to the importance of local natural resources was also achieved and the site is now being used as a training centre for a regional water management programme for agricultural communities in Jordan (ProAct Network 2008). The JVP exemplifies an EA approach to water planning, in that it is locally managed, environmentally sustainable, economically profitable, balances consumptive and non-consumptive usage of the land, and involves several societal sectors such as agricultural producers, consumers and local water managers.

Strengths of the EA

- It treats water as part of the broader ecosystem and in so doing seeks solutions that benefit both the watershed and the ecosystem in which it is found.
- It encourages systems thinking and solutions with more than one beneficiary.
- It promotes science-based recommendations grounded in reality.
- It encourages the local-level planning of natural resources.

Weaknesses of the EA

- It requires significant up-front capital to obtain all the data necessary and to complete the initial monitoring and evaluation needed to formulate ecosystem-friendly solutions.
- It requires extensive coordination between actors at all scales.
- Incorporating all 12 principles is time consuming and often will not be feasible.
- Different societies have different ecosystem values: the EA does not take this into consideration.

**Recommendations for a methodology for improving and maintaining water security**

Our recommended methodology, the PDIA approach, is premised on four primary principles: 1) locally derived solutions to local problems; 2) an authorising environment that facilitates and encourages experimentation and creative thinking; 3) the implementation of projects with tight feedback loops allowing for ongoing review and experiential learning; and 4) the engagement of broad stakeholder support and contribution at all stages of programme development. These principles are necessary elements of the methodology and underpin all work done under the PDIA umbrella. However, there is no PDIA prescription, meaning that the authors do not lay out a framework for how to “do PDIA”, in keeping with their central conceit that prescriptive solutions lead to suboptimal outcomes too focused on checking the boxes instead of actually fixing the problem(s) at hand. Nevertheless, lessons can be drawn on how to implement PDIA from the many case studies that now exist in which the approach has been employed.

**First, it is important to identify problems at the local — in this case municipal — level and to investigate the root causes of these problems,** instead of debating which solution to adopt. In the case of water security, often envisioned as a national-level issue, the root causes of insecurity may be different in different locations. Some communities may suffer from unequal access to water, some from poor water quality, others from insufficient quantity, or a combination of all of these things. Whatever the case, time must first be spent in the community investigating why access to safe, clean water of a satisfactory quantity is (or is not) currently lacking. Exercises such as the “5-whys” technique mentioned earlier (Andrews et al. 2012) can be used here to help to deconstruct problems and hone in on the underlying causes of insecurity. Engaging multiple, diverse actors from the community is essential at this stage and can be done through a variety of methods from canvassing the community to identifying and engaging local civic and religious leaders to holding public meetings. It should be said here that this is not meant to be stakeholder engagement for stakeholder engagement’s sake. These multidisciplinary actors will help lead the solution-finding process and should remain enfranchised and accountable throughout the implementation process. Their contributions help to ensure that the solutions are community focused and relevant to local conditions.
Figure 46. The block scheme of the proposed LWSAP process
Second, in order to foster solutions to water security issues at the regional and national level, broad experimentation and “positive deviance” must be allowed at the local level (Andrews et al. 2012). There should be no preference for certain types of solutions. Traditional methods of water collection such as the saqiya should, at least initially, remain on equal footing with desalination or other modern methods of water provision. Once the working group identifies solutions, small pilot projects can be tested with ongoing monitoring and evaluation to determine what is working and what is not. This iterative process allows for increased flexibility and experiential learning. It also facilitates tighter group cohesion as they go through the process of trial and error (Andrews et al. 2012). The other benefit of this process is that it is adaptive. Given the increasing variability of water resources associated with global climate change, solutions that work today may no longer be appropriate in five or ten years. There is a much larger literature on building adaptive institutions than can be addressed here (Olsson et al. 2004; Tompkins and Adger 2004; Berkes et al. 2002; Folke et al. 2005), but ensuring that any solutions identified and implemented can be adjusted when necessary, while at the same time offering assurances regarding current operations, is key to long-term water security.

Once problems have been identified, working groups assembled and potential solutions piloted, the ongoing monitoring and evaluation of progress are necessary to ensure projects are on the right track. In the realm of water planning, this could include installing or improving well monitors, monitoring bottlenecks in water service provision to see if they are being resolved, or completing a water sustainability assessment. Where there is success, communities of practice can help diffuse knowledge horizontally to other municipalities and vertically to other levels of government. The key to PDIA is that there is no one-size-fits-all solution. Water security must first be addressed at the local level before national solutions are promulgated. We do not wish to suggest that all water security problems can be solved locally: They cannot. However, it is the appropriate starting point for understanding the root causes of water insecurity and can provide a cost-effective and robust base for sustainable water security. Without local support and participation, national water security cannot be achieved or sustained.

Preliminary stakeholder analysis (the example of Jordan)

Methodology for stakeholder analysis

Stakeholder analysis is a process of systematically gathering and analysing qualitative information for determining whose interests should be taken into account when developing and/or implementing a policy or programme (Schmeer 1999). Furthermore, the purpose of stakeholder analysis is to indicate whose interests should be taken into account when making a decision. At the same time, the analysis can indicate why those interests should be taken into account.

The stakeholder analysis method has been applied to gain a better understanding of actors’ roles and actions, to analyse driving forces and existing coordination among stakeholders, as well as to identify bottlenecks in communication that affect daily operations or strategic planning for the future. In addition, it contributes to improved project design using local knowledge, a better understanding of projects and issues, the integration of various interests and opinions, public acceptance of decisions, and the fostering and development of social learning (Luyet 2012). But it also leads to a sense of ownership over the process and outcomes and may significantly reduce implementation costs (Reed 2008). Stakeholder analysis enables the integration of stakeholders’ values and perceptions into planning, which is essential for the successful management of natural resources.

Without a clear definition, everybody can be considered as a potential stakeholder (Tullberg 2013). The literature offers a wide range of definitions of who is a stakeholder. According to the definition commonly used in natural resources management research, a stakeholder is any individual, group
or institution that would potentially be affected, whether positively or negatively, by a specified event, process or change (Gass 1997). This definition is broadened by Buanes et al. (2004) to any group or individual who may directly or indirectly affect — or be affected by — planning.

When implementing a participatory process, stakeholder participation should be considered from the concept development and planning stage, through implementation, to the monitoring and evaluation of outcomes. Engagement with stakeholders as early as possible in decision making is essential if participatory processes are to lead to high-quality and durable decisions.

**Stepwise protocol for stakeholder analysis**

Stakeholder analysis can be divided into four main steps:

- **Step 1. Identifying the key stakeholders**
- **Step 2. Defining stakeholder groups**
- **Step 3. Characterising stakeholders**
- **Step 4. Investigating relationships between stakeholders**

The stepwise protocol gives a clear and logical step-by-step description of the actions that are needed for obtaining the necessary data for a successful participatory approach to natural resources management planning. All the required steps are described in detail in the following chapters.

For this study we use Jordan as an example for stakeholder analysis for several reasons, including the following:

- As described in the earlier chapters, the structure of Jordan’s decision-making system and water governance can be considered as typical for MENA countries in terms of the high level of centralisation, overlapping responsibilities, and a sometimes unclear power balance.
- Data availability: stakeholders in Jordan (both from the government and from the civil sector) have demonstrated a high level of willingness to cooperate in the stakeholder analysis process.

The following stepwise protocol for stakeholder analysis was used:

- **Step 1. Identifying the key stakeholders**: Stakeholders were identified through desk-based research and confirmed by a selected focal point and local water management experts in Jordan.
- **Step 2. Defining stakeholder groups**: Stakeholders identified in the first step were grouped on the basis of the sector to which they belong — governmental authorities, private sector, academia, civil society and other stakeholders.
- **Step 3. Characterising stakeholders**: Information for stakeholder characterisation was obtained through semi-structured Interviews designed following the approach suggested by Schmeer (1999) and tailored for the water management sector. The criteria for developing the questionnaire were as follows:
  - Interest in the case — this describes the self-reported level of interest of the interviewed stakeholder in the case, as specified by the interviewee. This value was also further revised and normalised based on crosschecking with other data sources and consistency with other quantitative and qualitative answers.
  - Power — this reports on the self-declared perception of power, based on availability and access to resources and the ability to mobilise them.
- Expert knowledge — this describes the self-reported level of knowledge of the interviewed stakeholder regarding the case. Self-defined knowledge was reviewed considering the provided description of the case and all stakeholders’ knowledge, highlighting four classes.

- Attitude — this reports the interviewee’s opinion regarding the case, with seven possible qualitative answers.

- Involvement in the water management process — this describes the existing and desired level of involvement in the water management planning process.

- Legitimacy — this reports on the self-declared perception of socially accepted and expected structures or behaviours.

- Attention-getting capacity — this parameter concerns the self-reported capacity for getting attention among all interested parties in the water-related sector.

- Information quality — this parameter concerns the self-reported general information of the case as available to the interviewed stakeholder from specific sources. This value was also further revised and normalised based on cross-checking with other data sources.

All stakeholders identified in the first step were invited to fill in an on-line questionnaire. After concluding the interviewing process, a “stakeholder table” database was developed and used for detailed stakeholder characterisation.

- Step 4. Investigating relationships between stakeholders: Completed questionnaires provided necessary input for assessing relationships between stakeholders. Each stakeholder provided data on the frequency of interaction (rare, quite frequent, frequent) with other stakeholders from the water management sector and listed those with whom they have regular or occasional contacts.

Results

Stakeholder analysis was carried with the main aim of gaining a better understanding of stakeholders’ roles and actions; analysing driving forces and existing coordination among them; and identifying bottlenecks in communication that could affect strategic planning for future sustainable water use in order to achieve water security in the study area.

Step 1: Identifying key stakeholders

A first list of stakeholders and interviewees, comprising representatives of different organisations and institutions, was based on desk research and information obtained by focal points and local experts from the study area. A final list of 72 stakeholders was produced after an inception workshop held in Jordan in March 2015.

Step 2: Defining stakeholder groups

All stakeholders identified in Step 1 were assigned to one of the groups presented in Table 38.
Table 38. Stakeholder groups

| Governmental authorities                  | Ministry of Water and Irrigation (MWI) |
|                                         | Ministry of Agriculture (MoA)          |
|                                         | Ministry of Environment (MoE)          |
|                                         | Local governments (LG)                |
|                                         | Ministry of Health/Environmental Health Directorate (MoH) |
|                                         | Ministry of Municipal Affairs (MoMA)   |
|                                         | Water Authority of Jordan (WAJ)        |
|                                         | Jordan Valley Authority (JVA)          |

| Private sector                          | Agricultural Credit Corporation (ACC)  |
|                                         | Arab Dar Engineering Company          |
|                                         | Green Tech Sustainable Environment    |
|                                         | JORCS Consultant                      |
|                                         | PanMed Energy                         |
|                                         | As-Samra Wastewater Treatment Plant Company |
|                                         | Sustainable Environmental and Energy Solutions (SEES) |
|                                         | Talal Abu Ghazaleh Organization (TAG)  |
|                                         | Arabia Group (AG)                     |

| Academia                                | University of Jordan (UoJ)            |
|                                         | Mutah University (MU)                 |
|                                         | Jordan University of Science and Technology (UoJ) |
|                                         | Royal Scientific Society (RSS)        |

| Civil society                           | Arab Countries Water Utilities Association (ACWUA) |
|                                         | Arab Network for Environment and Development (RAED) |
|                                         | Imprint Goodness Association           |
|                                         | Eco Peace Middle East                  |
|                                         | EDAMA Association                      |
|                                         | Future Pioneers for Empowering Communities |
|                                         | Land and Human to Advocate Progress (LHAP) |
|                                         | Majlis El Hassan organisation          |
|                                         | Sustainable Environmental and Energy Solutions (SEES) |
|                                         | Jordanian Climate Change and Environment Protection Society (JOCEPS) |
|                                         | United Society for Developing Water Resources and Environment (USDWE) |

| Other                                   | IUCN, GIZ                              |

**Step 3: Characterising stakeholders**

In order to assess stakeholders’ power, interest, knowledge, attitudes, legitimacy and attention-getting capacity, as well as their level of existing involvement and desired level of involvement in the water management process, the quality of water-related information available to them, and interactions among them, semi-structured interviews were conducted with 72 representatives from a variety of organisations identified in Step 1.

Interviewing was carried out using an on-line questionnaire, and all the data obtained were summarised in a “stakeholder table”.

**Analysis of power, interest and knowledge of stakeholders**

The results of the questionnaire regarding the power and interest of stakeholders to participate in the water management planning process were analysed using a “power versus interest” diagram (Figure 47). The results of the power and interest analyses are presented in Figure 48 and Figure 49.

This analysis made it possible to divide stakeholders into the following categories:
Key players (with a primary interest and high power): Ministry of Water and Irrigation (MWI), JORCS Consultant, Arab Dar Engineering (ADEng), University of Jordan (UoJ), Arab Network for Environment and Development (RAED).

Key players also include: Jordan Valley Authority (JVA), Sustainable Environmental and Energy Solutions (SEES) and ACWUA, which have both high power and high interest.

Small players (with a primary interest but medium power): Ministry of Health/Environmental Health Directorate (MoH), Al-Balqa’ Applied University (ABAU), Majlis El Hassan Organisation (MEIH) and Eco Peace Middle East. Stakeholders with high interest and medium power also belong to this group:

- Governmental institutions — Ministry of Municipal Affairs (MoMA), local government (LG), Water Authority of Jordan (WAJ), Public Security Directorate/environmental rangers (PSD).
- Academia — Jordan University of Science and Technology (JUST), Mutah University (MU), Royal Scientific Society (RSS).
- Private sector — Samra Wastewater Treatment Plant Company, Agricultural Credit Corporation (ACC), Green Tech Sustainable Environment (GrTech), Talal Abu Ghazaleh Organization (TAG), Arabia Group (AG).
- Civil society — EDAMA Association, Future Pioneers for Empowering Communities (FPEC), Land and Human to Advocate Progress (LHAP), United Society for Developing Water Resources & Environment (USDWE), Jordanian Climate Change and Environment Protection Society (JOCCEPS).
- Other — IUCN.

Context setters have power but little direct interest. One clear context setter is Pan Med Energy (PMedE), which has power but no direct interest. Stakeholders with medium power and general interest such as the Ministry of Environment (MoE), the Ministry of Agriculture (MoA), Imprint Goodness Association (AssIG) and GIZ also belong to this group.
Figure 47. Power versus interest diagram

The group of key players is well defined: clearly dominant players are MWI, JORCS, ADEng, UoJ and RAED. The study shows that there are no clear subjects, since all stakeholders involved in the survey have at least medium power, which makes them small players rather than subjects. The group of small players is quite heterogeneous, with a variety of reasons to be interested in water management issues. Finally, the analysis shows that there is no group of context setters (with minimum or limited interest) and no crowd (with little interest or influence).

Table 39. Level of knowledge regarding water management issue

<table>
<thead>
<tr>
<th>Level of knowledge</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>Other</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the analysis of stakeholders’ knowledge regarding water management issues are presented in Table 39. Stakeholders are quite knowledgeable: 19 of them even claimed to have complete knowledge, while nobody claimed to have low knowledge.

It is clear that stakeholders have complete knowledge of the water management process as long as they are interested in it, while the same is not true regarding power. Some interviewees stated that they have medium power but were very interested in, and familiar with, the water management process. These included representatives of academia and some NGOs.

Stakeholders with such high levels of both interest and knowledge should be more involved in order to defuse any potential opponent and obtain valid support.

A detailed analysis was carried out in which all identified stakeholders were considered individually, as presented below.

**Governmental authorities (MWI, MoE, MoA, MoMA, WAJ, JVA, LG, PSD):** The MWI is a key player and is responsible for the overall monitoring of the water sector, the water supply and wastewater systems, the formulation of national water strategies and policies, research and development, information systems and standardisation, and the consolidation of data. The MWI embraces the two most important entities dealing with water in Jordan: the Water Authority of Jordan (WAJ), which is in charge of water and sewerage systems; and the Jordan Valley Authority (JVA), which is responsible for the socioeconomic development of the Jordan Rift Valley, including water development and the distribution of irrigation. The power versus interest analysis shows that the WAJ belongs among the small players with medium power and high interest, while the JVA is a key player and has high power.

The MoE and MoA have general interest and general and deep knowledge respectively, and medium power with respect to the water management planning process, which makes them context setters that should be more involved in order to secure valid governmental support. The MoE has a mandate to improve the quality of the Jordanian environment by conserving environmental resources and contributing to sustainable development. It is in charge of water resources pollution issues and has no direct jurisdiction over water management planning. The MoA’s interest lies in the fact that water for irrigation represents 72 percent of water demand and is competing with an exponential rise in water demand in the municipal, industrial and tourism water use sectors.

On the other hand, the MoMA, which supervises the activities of the municipalities, has high interest in participating in the process, in particular at the local level, but medium power in the water management sector, which makes them small players. According to the survey, the local government also belongs to this group, although decision-making power related to most policy and strategic planning issues is restricted to the regional authorities — that is, governorates and the relevant ministries.
The PSD/environmental rangers, which is Jordan’s counterintelligence agency operating under the Ministry of the Interior, is a small player that is interested in the water security issue at local level.

**Business sector:** The business sector is represented by nine companies that are predominantly active in identifying innovative technological solutions for the water sector, or in providing relevant consultancy.

Arab Dar Engineering Company (ADEng), which has expertise in a range of efficient, renewable and passive technologies, is able to influence both building design and policy development. It declared itself as having complete knowledge about water management planning, a primary interest and high power to influence the planning process thanks to relationships with the government, international clients and joint venture partners. JORCS Consultantshas the same power and interest, with a deep knowledge that places it in the key players group.

Sustainable Environmentaland Energy Solutions (SEES) deals, among other things, with environmental management projects, and in particular those related to wastewater treatment and water re-use, and with enhancing institutional capacity on related issues. It has a strong link with local government. High power and high interest make SEES a member of the “players” group.

PanMed Energy addresses the challenges of developing renewable energy plants to help meet Jordan’s urgent domestic needs and, eventually, export electricity to the greater Mediterranean grid. It has no direct interest in water management issues but has high power, which makes it a clear context setter that should be involved in finding sustainable solutions to combat the water shortage in Jordan.

Agricultural Credit Corporation (ACC) contributes to agricultural development by funding projects for farmers as the official and specialised source of agricultural credit. The ACC is an important means of implementing the national strategy for agricultural development, as well as contributing to mitigating the burdens of agricultural risks. Its interest in the water management issue is high, but its power in the water management sector is medium while knowledge of water issues in general, and of water management planning in particular, is at an average level.

As-Samra Wastewater Treatment Plant is the largest wastewater treatment facility in Jordan, which was built to improve the quality of water in Jordan. It treats wastewater released from the Zerqa River Basin, which is part of the two populous cities of Greater Amman and Zerqa. Its high interest and medium power place it in the group of small players, together with Arabia Group (AG), a company whose primary activities are focused on the water and energy sectors, Green Tech Sustainable Environment (GrTech) and Talal Abu Ghazaleh Organization (TAG).

**Academia:** The various academic and research stakeholders, such as Jordan University of Science and Technology, Mutah University, the University of Jordan, the Royal Scientific Society and Al-Balqa’ Applied University have a high human resources capacity and knowledge, which they use in training, analysis, planning and consulting. Bearing in mind that expertise developed by different researchers is highly recognised by other stakeholders, their views indirectly affect activities related to the topic of water management. As this is the topic of their academic focus, they show great interest in what is happening and make efforts to keep informed.

They themselves do not have direct power in the water management process, but, as they are consulted by other stakeholders, they have some influence through their expertise. They have an impact and influence especially on the medium- and long-term prospective decisions to be taken by other key stakeholders.

The power versus interest analysis showed that the University of Jordan has the highest power in the water management sector together with key players such as the MWI, JORCS and ADEng. The power could come from more frequent direct involvement as a consultant in water management issues than other academic stakeholders.
Civil society: In this study, civil society is represented by 10 NGOs that are considered public opinion representatives or mobilisers.

The Arab Network for Environment and Development (RAED) is an association of societies concerned with the environment and sustainable development from different Arab countries, including Jordan. The network focuses on advancing dialogue between Arab state authorities and their international counterparts, as well as ministries and organs concerned with the environment in the Arab world and the League of Arab States. Its positioned high on the power scale in water-related topics, which, together with its primary interest, make it part of the “key players” group.

Also among the players with high power and high interest is the Arab Countries Water Utilities Association (ACWUA), a professional regional association that aims to build a solid platform for water professionals from all over the world to meet and exchange their knowledge and expertise and to learn about the latest water technologies and solutions in the water and wastewater sector.

Other identified NGOs have a high or primary interest in water management issues and medium power, which makes them small players that should be involved in the process but further capacitated and empowered.

Other stakeholders: The German Agency for International Cooperation (GIZ) supports the implementation of various projects that focus on poverty reduction and institutional capacity building in the region. It supports the implementation of the water strategy in Jordan and is well connected to key players such as the MWI, although it does not have a lot of formal power.

The International Union for Conservation of Nature (IUCN) does not have a lot of power, but, thanks to good cooperation with governmental institutions and with educational and scientific organisations established through different programmes and projects, it is influential and should be more involved in the water management process.
Analysis of stakeholder attitudes

An analysis of data concerning the attitudes of stakeholders towards the water management planning process shows a generally positive picture (Table 40, Figure 50). Key stakeholders with a high level of interest and high level of power in decision making are strongly supportive, as are other stakeholders with less power. In total, 19 out of 35 analysed stakeholders have a strongly positive attitude, while 13 are positive and 3 neutral.

The most supportive stakeholder group is the business sector, with eight representatives supporting the water management planning process, seven of whom are strong supporters and only one neutral.

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>International organisations</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly positive</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Positive</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Slightly positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Slightly negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Among governmental institutions there are eight supporters, four of which are strongly positive, which is in correlation with their decision-making power. Local government turned out to be neutral, which is in line with their medium power and average water management planning knowledge.

The analysis also shows that there are only three stakeholders that are currently neutral towards water management issues: local government, Talal Abu Ghazaleh Organization and Eco Peace Middle East. They represent different sectors that are not well connected to each other and that have no specific alliances between them.
In the case of main stakeholders, such as local government, this nevertheless constitutes a certain risk, since local government is supposed to take an active role in the drafting of a local water security action plan.

One strategy for involving neutral stakeholders is to maintain good contacts with all of them and to pursue an open and transparent communication channel so that they are recognised as being in charge and can be directly contacted if required.

Analysis of stakeholder involvement in water management

The results of the assessment of the current situation in the study area regarding stakeholder involvement in water management show that stakeholder participation is secured, in particular, at the level of involvement. As shown in Table 41, 14 respondents claimed to be involved while 8 claimed to participate actively in the process. Governmental institutions are included in the process at the highest levels (involvement and active participation), while the business sector is mostly informed but rarely participates actively in water management planning. Civil society does not participate actively in the planning process, with the exception of the ACWUA, although involvement is satisfactory since 6 of the 10 organisations covered by the survey stated that they are involved in water management.

Educational and scientific organisations do not participate equally in the process. The UoJ is a key player with a high level of power and a primary interest; and JUST is a small player, having medium power and high interest. Both participate actively in the process, while ABAU is only informed, which positions it at the lowest level on the “participation scale”.

The analysis of the desired level of involvement in the water management planning process, presented in Table 42, shows that governmental institutions and civil society want to participate actively (7 and 6 respectively) or to be involved (2 and 4 respectively). All academic institutions covered by the survey want to participate actively without exception, while the majority of business
sector representatives are satisfied to be consulted (4), two want to be involved and three (JORCS Consultant, Samra Wastewater Treatment Plant and SEES) want to participate actively.

Table 41. Existing level of stakeholder involvement in the water management planning process in Jordan

<table>
<thead>
<tr>
<th>Existing level of involvement</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>Other</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Consultation</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Involvement</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Active participation</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Table 42. Desired level of stakeholder involvement in the water management planning process in Jordan

<table>
<thead>
<tr>
<th>Desired level of involvement</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>Other</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultation</td>
<td></td>
<td>4</td>
<td>2</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Involvement</td>
<td></td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Active participation</td>
<td></td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>

Analysis of level of legitimacy

The assessment of stakeholders’ legitimacy in terms of participation in water management is summarised in Table 43. The results show that the legitimacy of the stakeholders involved in the survey is satisfactory, since all of them claimed to have a high or medium level of legitimacy (with the exception of the Arabia Group [AG]). The most legitimate group of stakeholders is civil society, with as many as nine representatives claiming to have a high level of legitimacy; and governmental authorities, with six “highly legitimate” respondents.

Table 43. Level of stakeholder legitimacy to participate in the water management planning process in Jordan

<table>
<thead>
<tr>
<th>Level of legitimacy</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>Other</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>

Analysis of attention-getting capacity

The assessment of stakeholders’ attention-getting capacity in the water management sector, on a scale from very low to very good, is summarised in Table 44.

Ten of the interviewed stakeholders claimed to have very good attention-getting capacity, including four NGOs and three representatives of the business sector, while 11 respondents claimed an acceptable level of attention-getting capacity.

In order to be more visible and capable of involving the interested public in the water management planning process, the further capacity building of stakeholders claiming to have acceptable attention-getting capacity is necessary.
Table 44. Attention-getting capacity of stakeholders in Jordan’s water sector

<table>
<thead>
<tr>
<th>Level of attention-getting capacity</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>International organisations</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Acceptable</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quality of available information on water-related issues

The quality of the information on water-related issues available to stakeholders is good according to 14 respondents, and very good according to 11 respondents. Governmental authorities and civil society are especially positive about the quality of information, while representatives of academia have mixed opinions, as shown in Table 45.

Bearing in mind that NGOs involved in the survey claimed to have regular contacts with the MWI, it can be concluded that the information flow between NGOs and the governmental sector dealing directly with water management is unobstructed.

Table 45. Quality of water-related information according to stakeholders in Jordan

<table>
<thead>
<tr>
<th>Information quality</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>International organisations</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Acceptable</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Good</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Very good</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

Step 4. Investigating relationships between stakeholders

Relationships between stakeholders are assessed in terms of the frequency of cooperation, using a scale from rare to frequent. This analysis also made it possible to identify stakeholders that are hubs of cooperation, and those that are isolated although important for water management planning.

Cooperation with other organisations

Regarding the frequency of cooperation among stakeholders, the overall assessment (Table 46, Figure 51) shows that few stakeholders rarely cooperate with others. Thirteen respondents stated that they have quite frequent cooperation, and 19 respondents claimed to have frequent cooperation, with other organisations involved in water-related issues. The sector with the most representatives that frequently cooperate with others is civil society. Relationships among stakeholders are presented in the stakeholder matrix (Figure 52).

Table 46. Frequency of interaction among stakeholders in Jordan

<table>
<thead>
<tr>
<th>Frequency of interaction</th>
<th>Governmental authorities</th>
<th>Academia</th>
<th>Business sector</th>
<th>Civil society</th>
<th>International organisations</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare</td>
<td>1 MoE</td>
<td>1 (PMedE)</td>
<td></td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Quite frequent</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Frequent</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>
Figure 51. Frequency of interaction among stakeholders in Jordan
Figure 52. Stakeholder cooperation matrix in Jordan
The study shows that the MWI, as a key player, is very well connected to all groups of stakeholders. It has regular direct contacts with the JVA, the WAJ and the MoE, and it occasionally cooperates with the MoMA, the MoA, environmental rangers within the PSD, academic institutions and some NGOs. Cooperation with NGOs and universities is limited to data sharing. The MWI is central in information networks and contact exchanges, with good links to all the other major stakeholders in the government, academic and private sectors. It acts as a hub for stakeholders in the water management sector.

From the other side, out of 10 interviewed NGOs stated that they have regular contacts with the MWI, as well as the SAMRA Wastewater Treatment Plant, the UoJ, the RSS, GIZ and IUCN. Cooperation with the business sector, and cooperation among NGOs themselves, turned out to be weak.

The MoH is quite well connected with other governmental authorities, having strong cooperation with the MWI, the JWA, the MoE and companies supplying drinking water (the Jordan, Yarmouk and Aqaba water companies). This cooperation takes the form of continuous contacts and meetings, regular correspondence and joint fieldwork in the framework of drinking water quality issues.

According to the analysis, local government has no direct ties with any other stakeholders and is quite isolated in the field of water management. The same is true of the MoMA.

Jordan University of Science and Technology stated having occasional contacts with the MWI, the MoA and the MoH, providing them with training and consultancy.

The UoJ has regular contacts with the MWI, the JVA, the WAJ, the private sector, international agencies such as the World Bank and the International Center for Agricultural Research in Dry Areas (ICARDA), international projects, the United Nations Economic and Social Commission for West Africa (ESCWA), USAID, FDA and the Food and Agriculture Organization (FAO). The high level of power that makes the UoJ a key player comes from its strong contacts with different groups of stakeholders, including international organisations and donors.

The RSS is very well connected with governmental institutions and experts from universities due to its membership of multi-stakeholder decision-making bodies and committees, including the Higher Committee for Water Quality (headed by the secretary general of the JVA) and the Water and Wastewater Committee (headed by the Jordan Institute for Standards and Metrology [JISM]). The RSS also participated effectively in the NICE project (National Implementation Committee for Effective Decentralised Wastewater Management in Jordan) in close cooperation with the MWI. It prepares technical reports on monitoring programmes, providing accurate information to help decision makers.

The business sector is not well connected to stakeholders that are important in water management, but it has good cooperation with international organisations and donors. Exceptions are the Samra Wastewater Treatment Plant Company, which cooperates regularly with the MWI, the JVA, the WAJ and civil society (agricultural associations and NGOs); JORCS Consultants, which regularly cooperates with the MWI; and GrTech, which cooperates with the RSS, the Royal Society for the Conservation of Nature (RSCN), ACWUA, Friedrich-Ebert-Stiftung and GIZ in order to share goals and suggest new activities.
All NGOs have well-established cooperation with the MWI, while LHAP and MEIH regularly cooperate with other ministries as well.

The ACWUA cooperates with 106 water utilities (government and private) from 18 countries, either as members or through regular activities.

There are particularly good contacts between GIZ and the MWI, since GIZ supports the implementation of the water strategy, while IUCN has regular contacts with ministries, universities and research institutions.

It is also important to consider the level of interaction between the stakeholders presented in Table 42 and Figure 51). An actor that has frequent contacts with others should be able to collect information faster and of a better quality, thus having a clearer picture of the system. Local communities are again not connected, as they are formally represented only by the MoMA.

Conclusions and recommendations regarding stakeholder participation

The stakeholder analysis shows that all identified stakeholders should be involved in the process of drafting local water security action plans, according to their interest, power, knowledge, attitude, level of legitimacy and attention-getting capacity.

Recommendations for appropriate stakeholder participation are as follows:

- “Key players”, particularly line ministries in charge of water, have to be involved in the process from the very beginning since they have a high level of both power and interest, with good links with all other major stakeholders in the governmental, academic and private sectors.

- In order to secure a successful participatory approach, it is necessary to include less powerful stakeholders who nevertheless express significant interest — that is, small players. Bearing in mind that the majority of stakeholders covered by the survey belong to this group, they should be empowered through training for active participation in developing local action plans, or should at least be involved.

- Government authorities are well positioned on the “power versus interest” diagram, although their relations with other stakeholders should be strengthened. Local government is quite isolated and does not have direct contacts with other stakeholders dealing with water management. It is necessary to improve the knowledge and skills of local government regarding water management, which should contribute to their better involvement in the process and their better connection with other water-related stakeholders.

- Academia is well positioned and is perceived as independent and evidence based, thus should play an important role regarding information exchange, which it carries out through its training and consulting services. Academia can play a better intermediary role as a knowledge broker between all groups of stakeholders.

- NGOs, which represent the public interest with regard to environmental concerns, have a good knowledge of water management issues and obtain all the crucial information from the main governmental stakeholders. However, since they are not well connected among themselves, it is advisable to establish a platform for
their cooperation for the purposes of developing local water security action plans. Such a platform should also bring together local NGOs in order to secure the fair representation of local interests.

- The business sector should be more involved in water management (the majority of business sector representatives are involved only at the level of information supply) since it has power but is not always interested in water-related issues. Their good connections with foreign donors and international organisations should be used as an opportunity for solving local and national water-related problems. One possible way to motivate them to be active players is by establishing public–private partnerships.

The above recommendations can be easily extended to all MENA countries covered by the present study.
Conclusions and recommendations

Conclusions

This report assesses local water security for improved water management in selected countries in the MENA region. The assessment aims to contribute to the development of an implementation plan for Component 2 ("Water and Security") of the project “Sustainable Use of Transboundary Water Resources and Water Security Management” (WATER SUM), and to form a solid basis for future project activities.

The countries relevant for this assessment are Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.

Political and economic context

The total area of the MENA region (21 countries) is 11.1 million km², and it is home to a population of 381 million. The region’s main climatic and environmental features are arid conditions (about 85 percent of the area is desert) and the scarcity of water resources. The MENA region is the richest in the world in terms of oil and gas reserves and among the poorest in terms of renewable water resources.

Currently, MENA countries face major development challenges, from rapidly growing young populations, high unemployment rates and vulnerability to price shocks and climate change, to political and security challenges, including extremism and, most recently, violent conflicts in Libya and Syria. After the profound social and political changes in 2011, the region is still fragile and suffers from (mainly youth) unemployment, poverty and regional disparities. Recent events in the Arab world have added new challenges to the fragile peace and security of the region.

The region also faces growing challenges in the form of environmental stresses, resulting from population pressure, urban growth, water scarcity and pollution, desertification and climate change, which is exacerbating water shortages.

Although development planning frameworks differ significantly among the analysed countries, it can be concluded that there are significant improvements in this area.

Given the above, the analysed countries can be classified into three categories in terms of their suitability for WATER SUM Component 2 intervention, according to their current political and economic circumstances:

- countries in which it is not possible to implement project activities due to war operations and serious security threats (Syria and Libya);
- countries with fragile economic and, more importantly, political situations, exposed to certain security risks due to regional conflicts and internal tensions, in which it is possible to implement project activities, although difficulties caused by internal political and structural constraints can be expected (Algeria, Egypt and Lebanon); and
countries in which the implementation of project activities should not encounter major problems due to political and economic constraints (Morocco, Tunisia and Jordan).

Local responsibilities and power

Although a longstanding commitment, the level of decentralisation in MENA countries is still not satisfactory, even though in a number of countries—especially in North Africa—reforms have been initiated aimed at decentralisation. Central governments retain substantial powers to intervene in local affairs, mainly through the position of officials who are appointed by central government, while local elected authorities have in fact been kept under central government control. As a result, municipalities manage and implement central government programmes rather than their own, and are subject to the control of central government.

Institutions at municipal, provincial or regional level are often hybrid structures — that is, they are at the same time decentralised local authorities (with elected assemblies) and deconcentrated administrative units. There is often competition between the two kinds of local institutions, and as jurisdictions are not clearly defined this often results in overlapping, redundancy and conflict.

Decentralisation in the region has mainly been a top-down initiative, frequently initiated by international pressure and by international aid agencies. A number of the analysed countries have recently accelerated decentralisation (again as a top-down process), and have taken concrete steps towards a more decentralised system, mainly as a result of recent political changes in the region (notably Tunisia and Jordan). It seems that there is widespread recognition throughout the region that local governments need to become more transparent and accountable to local citizens. However, these reforms have been counterbalanced by measures that in fact increase the power of supervision by centrally appointed government representatives (notably Morocco and Algeria).

The quality of municipal planning remains a key challenge for municipalities throughout the MENA region. Planning schemes are usually guided by the master planning approach (usually referred to as “General Plans” or “Comprehensive Plans”) and focus almost exclusively on the spatial and physical planning of the city. There is a lack of consideration of stakeholder involvement by any means, because there is no mechanism for including them in the preparation or implementation of plans.

Local authorities lack resources and financial power, and there is a low level of local resources. In many cases local administrations are overstuffed with little productivity, due to a lack of technical expertise and transparency. As a result, the majority of responsibilities assigned to municipalities have remained fairly ineffective, and their services are inadequate. However, although numerous constraints hinder the decentralisation process and local government functioning, and although financial and political decisions are still made at the top, local authorities in most MENA countries are gradually learning to fulfil some key local functions — even if the shift in responsibilities has not been accompanied by related changes in power.
Water resources and water issues

Water resources are overexploited and the situation is likely to worsen in the future. Most of the region is classified as arid or semi-arid, and water is a scarce resource. Some 126.5 billion m$^3$ of total renewable water can be mobilised annually in the eight analysed countries, which means that currently total water demand exceeds naturally available water supplies by almost 20 percent. The quantity of water available varies considerably among MENA countries (from 113 m$^3$/inhabitant/year in Libya and 129 m$^3$/inhabitant/year in Jordan to 933 m$^3$/inhabitant/year in Lebanon), but is still below the 1,000 m$^3$/inhabitant/year threshold in all analysed countries. Average water availability per capita has dramatically shrunk in the last few decades (from an average of 2,925 m$^3$/per year in 1962 to 1,179.6 m$^3$ in 1992, and an alarming 743.5 m$^3$/in 2011) as a result of high population pressure, lower rainfall and higher evaporation due to climate change, overexploitation, poor water management and other issues. The current overall annual water demand in the analysed countries is 102 billion m$^3$, and it is projected to reach 160 billion m$^3$ by 2050 (under an average climate scenario). As a result, unmet demand (currently 6.6 billion m$^3$) will increase more than tenfold, to 65.5 billion m$^3$, endangering Egypt, Morocco and Syria the most. The threat of an imbalance between water demand and water supply in the MENA region is therefore real, although significant progress has been made through government efforts and the financial backing of international organisations.

In order to meet escalating demand, MENA countries rely on both conventional water resources (surface water and groundwater) and non-conventional resources (desalinated water, treated wastewater, irrigation drainage water, and water harvesting). From among the analysed countries, Jordan, Morocco and Syria depend more heavily on groundwater. Today, shortages are met primarily by unsustainably mining fossil groundwater reserves and partially by increasing water supplies through desalination. As a result, the water table has fallen strongly in recent years, leading to the salinisation of some (mainly coastal) groundwater, particularly in North African countries.

The main weaknesses of the water systems in the analysed countries are outlined below:

- In general, the **network of water pipes is outdated, too small, and in serious need of rehabilitation, reinforcement, repair and maintenance.** An enormous amount of water produced is non-revenue water, lost through network breakdowns, leakages and illegal consumption. The rates of systemic water loss from the municipal sector are excessive (estimates in Jordan, for example, are up to 70 percent, and 51 percent in Algiers, compared to 7 to 20 percent in Europe), due to high leakages in the water supply network.

- Similarly, the **wastewater infrastructure is outdated and in chronic need of maintenance.** Although wastewater treatment and re-use have been promulgated as a high-priority policy, especially in the most water scarce countries, additional efforts are needed to establish efficient re-use systems (water pricing reforms, infrastructure upgrading, awareness raising etc.).

- The use of water per sector is inefficient, with **high water allocations to agriculture** (84 percent of overall withdrawal on average in the analysed countries; more than 80 percent in Egypt, Libya, Morocco, Tunisia and Syria), for **municipal purposes** (10 percent on average), and **industry** (6 percent on average). Algeria,
Jordan and Lebanon have more balanced water usage, with nearly a third of overall water used for municipal purposes. As a result, prices for municipal use are high, subsidising agricultural water use (as is the case in Jordan).

- **The pricing of water is not efficient**, and this is accompanied by a mismatch between water intensity rates with production and value rankings. The coverage and monitoring of water meters is, in many cases, inadequate.

- **Adequate water conservation programmes and government subsidies to encourage conservation are limited or lacking.**

- **The product structure in the agricultural sector is inappropriate** throughout the region, as it includes the growth of water-intensive crops, such as citrus fruits, for export.

- **Political instability in the region** has also exacerbated water scarcity, raising new alarms over water availability.

Some 60 percent of MENA’s surface water is transboundary. From among the analysed countries, those with a sizeable share of water resources coming from other countries include Egypt (with a water dependency ratio of 96.86 according to the FAO AQUASTAT database); Syria (with a water dependency ratio of 72.36); and to some extent Jordan (with a water dependency ratio of 27.36). Regional water-sharing agreements are not well defined or lack enforcement, and are also far from equitable, reflecting asymmetrical power and military capabilities.

Another important issue is the deterioration of water quality, which is closely linked to water scarcity. Water quality is often at the lower limit of the relevant standards and the degradation of water resources in the region is high. The high demand for limited water supply often leads to decreasing water quality, both for domestic use, through an intermittent water supply provided to elevated tanks; and for agriculture, because of increasing water salinity caused by groundwater overexploitation. The rapid growth of the industrial sector results in the frequent discharge of untreated wastewater into natural water bodies. Today, the cost of water-related environmental degradation forms a significant part of GDP: almost 1.2 percent in Jordan and Morocco; and 1 percent in Egypt and Lebanon.

Recognition of the political importance of water seems to be improving in the region, and water is more and more seen as a priority area among governments. This has been the result of an increase in the levels of education and awareness among the population, which continue to improve together with improvements in socioeconomic conditions and the strengthening of civil society. It is also a result of the scarcity of the resource, the threat of climate change, the growing competition for water among various users, and the increasing investments in water infrastructure.

There has been notable progress at the level of institutions and governance approaches in the region. The reform of water policies, national water plans and financial approaches are the major factors in this regard. All of the analysed countries, with the exception of Egypt, are ruled by a single water act. The strategic framework is also comprehensive: with the exception of Algeria (where a water strategy is still under preparation), all of the analysed countries have developed either a long-term national water strategy or a national water master plan, and some countries have issued both documents. The
majority of the analysed countries developed their water sector strategic and action documents using the IWRM approach, and with well-designed horizontal and vertical coordination. Developed in close cooperation with international aid agencies, these documents form a stable basis for national initiatives and projects in the water sector.

The institutional setting in the water sector in the analysed countries is largely centralised and mostly managed at the national level, with little local stakeholder or civil society participation, resulting in ineffective, fragmented structures with the ministry in charge at the top of the decision-making pyramid and a clear hierarchy. The ministry assumes ultimate responsibility for the country’s water sector. Even in countries where responsibilities are largely decentralised, true devolution of powers has not been achieved. Responsibilities are decentralised, but the corresponding powers and resources are not transferred. The local representative of the state (governor, wali, prefect etc.) always has more power than the municipal leaders. The governor, who represents the central authority but who is more aware of local realities, must often follow the instructions of the central ministerial services. This is clearly the situation in Algeria, Morocco, Jordan and Tunisia, and, to a lesser extent, in Egypt, where large powers are concentrated in the hands of some governors.

Nevertheless, the process of decentralisation seems to be progressing, with river basin organisations, water boards and regional water entities (river basin agencies in Algeria and Morocco; regional water establishments in Lebanon; CRDAs in Tunisia) being either established or improved. Egypt, Jordan, Lebanon and Morocco seem to be more advanced than other countries, reflecting modern water principles in their national legislation. However, coordination between different water-related institutions is a major water governance issue. Rivalries between water institutions are common, and the responsibilities of each body are not always clearly established. Efforts have been targeted to improving the accountability of water sector operators and institutions, and the use of economic instruments has spread throughout the region. The same applies to progress in water demand management and water conservation practices.

The implementation of water policies showsonly modest levels of cross-sectoral coordination, with ineffective permanent structures and institutions. The many reasons for this include the overlapping of responsibilities among sectors, uncoordinated plans of action, a lack of incentives for coordination, power politics, a lack of transparency and fear of exposure, and a lack of synchronisation. Various levels of institutional fragmentation and overlapping responsibilities exist, often inhibiting effective IWRM. Planning and management are separate from budgeting processes. The enforcement of laws, the implementation of water pricing reforms and water governance–related issuesremain a challenge. Most efforts have failed due to inadequate compliance or poor enforcement.

A comparison ofthe analysed countries in relation to overall water governance capacity shows some countries to be more advanced. Jordan and Morocco both have high capacity for organisation in the water sector, demonstrated through both a high level of policy and legal improvements, as well as the inclusion of all relevant government organisations, encompassing not only those in the water sector, but also those in the closely related sectors of agriculture and the environment. The division of power allows the Jordan Valley, Jordan’s primary and most productive agricultural region, to develop and use water differently than the cities and surrounding desert areas. The shortage of trained and competent personnel to serve as local water authorities remains a major
A high level of capacity is also evident for infrastructure development, operation and maintenance in both countries.

Despite the recognition of several positive trends and tendencies within the analysed countries, many challenges remain. The **financing gap in the water sector** represents one of the main shortcomings in implementing water plans/strategies. The water sector, which is predominantly publicly owned, with little private sector involvement, has funding shortages. A significant proportion of financial support from donors through loans and grants still covers the largest part of infrastructure investments. Cost recovery is generally low, which has an impact on the financial sustainability of water services.

Water scarcity has both physical and socioeconomic causes. Physical scarcity arises from climate conditions (water shortage) and unsustainable management (over-abstraction). **Urbanisation, population growth and climate change exacerbate the region’s natural water scarcity and widen the gap between supply and demand.** Threats include natural variability, pollution and overexploitation.

**Population growth will exacerbate the already existing water crisis.** The population of the MENA countries, estimated at 309 million in 2000, is expected to reach about 651 million by 2030, putting greater pressure on water infrastructure. Rising living standards and a sizeable young population pressing for enhanced economic growth will further boost water demand. The expected increase in water stress related to population growth will affect most countries in the MENA region, but groundwater-based countries (Algeria, Tunisia, Libya and Jordan), which already suffer from water stress, will be the most severely affected.

**Climate change impacts may worsen this situation to the point where social conflicts arise as water resources become scarcer and access to water more difficult.** The overall trend towards reduced precipitation coupled with higher temperatures and higher rates of evaporation will reduce agricultural and pastoral productivity. A rise in sea level is also predicted to impact large areas in the MENA region. With growing demand for water, especially in cities, as well as growing shortages due to prolonged droughts, water will increasingly be allocated away from agricultural areas, causing rural hardship and accelerating migration to cities and abroad. Projected changes in climate will further exacerbate the existing challenge of providing adequate infrastructure, housing, employment and social services, heightening the potential for social, political and economic conflicts. More or less all of the analysed countries are exposed to similar weaknesses that can worsen their vulnerability to climate change. They are over-dependent on water-sensitive economic sectors such as agriculture, grazing, eco-tourism and aquaculture. The ecological base has already been harmed, particularly through water pollution, land degradation, desertification and loss of biodiversity. In addition, the technological skills and financial and human resources to improve the water sector’s resilience to climate change are relatively limited.

Recognising these future challenges, most MENA countries have identified a number of potential actions that could be taken to reduce their vulnerability, particularly with respect to water and agricultural resources. However, when it comes to progress made on the water-related adaptation policy framework, various assessments show that **progress has tended to be limited to moderate** in MENA countries.
The participation of NGOs and WUAs in water planning and implementation is increasing throughout the MENA region, particularly in local water management consultations. Moreover, the WUAs demonstrate the importance of joining local knowledge with modern information tools. Local community stakeholders and WUAs have been established throughout the region, with the aim of fostering farmers’ participation in the irrigation sector, with the roles and responsibilities of the government and farmers evolving over time. However, stakeholder participation in water issues in the analysed countries is modest in terms of water planning, and inadequate with respect to plan implementation. Although the participatory approach is relatively well recognised through the presence of WUAs, effective participation in water management and decision making remains weak and, in some countries, lacks supporting legislations. The main constraint to the sustainable functioning of WUAs in the region is the merely nominal support to decentralisation. This includes not only a lack of the necessary incentives (policy and technical guidance, mechanisms and regulations), but also low (local) capacities and the limited or non-existent accessibility of local communities to decision making.

Indicator-based benchmarking for water security

The MENA countries covered by this analysis (excluding Libya and Syria) were evaluated with respect to their performances related to water security. The evaluation was based on a set of internationally recognised indicators (used in multiple criteria analysis), grouped according to three contextual groups: (1) physical water stress; (2) overall physical, social and environmental water scarcity; and (3) government performance. Each contextual group encompassed a separate set of indicators, as shown in Figure 39. The analysis was carried out following the assumption that the higher overall rank of a country means that that country faces more severe water scarcity and that planned ODA will bring more efficient, accountable and sustainable effects with less effort on the part of stakeholders.

The results of multiple criteria analysis are used to indicate overall ranking, as well as the specific ranking of the countries (with respect to each contextual group). The analysis indicates that Jordan is the most suitable country of the six countries analysed for WATER SUM Component 2 interventions in relation to local water security, with a total score of 81.75. The higher rank of Jordan can be attributed to the higher score for the physical water stress indicators. Tunisia was ranked second (with a total score of 76.68) and Morocco third (with a total of 69.71), both being particularly exposed to overall physical, social and environmental water scarcity. All three countries were ranked higher in the context of government performance than other ranked countries, which indicates their relative political stability and accountability, and the quality and effectiveness of their legal base. Other countries had the following total scores: Algeria 62.58; Egypt 58.62; and Lebanon 55.78.

Methodology for Local Water Security Action Planning

Local water security action planning (LWSAP) usually comprises two interrelated steps: an assessment of the current status of water security; and the development of a management or action plan. In identifying the most appropriate methodology for the MENA countries covered by this study, we selected two methodologies for the
assessment of water security (the Water Security Status Indicators, [WSSI]; and the Canadian Water Sustainability Index [CWSI]); and four methodologies for the management of water security (community-based water resources management [CBWRM]; Light IWRM; Problem-Driven Iterative Adaptation [PDIA]; and the Ecosystem Approach [EA]). The assessment of the methodological approach was based on various criteria, including the scope of planning; the scale of planning; applicability; data availability; and financial constraints.

Following the comparison of assessment methods, we recommend applying elements from both the WSSI and the CWSI, as illustrated in Figure 53.
In determining which water security methodologies are best suited to the needs of the municipalities, we looked for an approach that is neither too wide nor too narrow in scope; can be scaled up or down as necessary; is applicable across a broad spectrum of on-the-ground conditions; can be applied in places where data gaps and data availability do not preclude implementation; and is financially feasible. Based on the scale at which we are working (municipal), and given the fact that earlier water management projects have been initiated with varying success in the region, we recommend the use of a methodology that builds on existing water security management activities and local knowledge rather than proposing a wholesale set of new solutions. For this reason, we recommend the use of the PDIA approach, which is problem driven, fosters step-by-step activities with rapid, results-oriented learning, engages a broad set of stakeholders from
the very beginning, and focuses on reforming and building on past activity rather than reflexively proposing new solutions. Figure 54 shows the block scheme methodology to be used, based on the PDIA approach.

**Stakeholder analysis**

The stakeholder analysis showed that all identified stakeholders should be involved in the process of drafting local security action plans, according to the level of their interest, power and knowledge, their attitude, their level of legitimacy and their attention-getting capacity. Jordan was used as an example for the stakeholder analysis, given that the structure of Jordan’s decision-making system and water governance can be considered as typical for MENA countries in terms of their high level of centralisation, overlapping responsibilities, and sometimes unclear power balance. Additionally, Jordanian stakeholders (from both the government and the civil sector) demonstrated a high level of willingness to cooperate in the stakeholder analysis process.

According to the preliminary stakeholder analysis, the “key players”, particularly line ministries in charge of water, have to be involved in the process from the very beginning. However, in order to ensure a successful participatory approach, it is
necessary to include less-powerful stakeholders who nevertheless express significant interest (i.e. small players). Horizontal and vertical cooperation are apparently a burning issue in relation to stakeholder participation. Government authorities are well positioned on the power versus interested diagram, although their relations with other stakeholders should be strengthened. Local government is quite isolated and does not have direct contacts with other stakeholders dealing with water management. Academia can play a better intermediary role as a knowledge broker between all groups of stakeholders. Non-governmental organisations, which represent the public interest with regard to environmental concerns, have good knowledge of the water management issue and obtain all crucial information from the main governmental stakeholders. However, they are not well connected among themselves, thus it is advisable to establish a platform for their cooperation for the purposes of developing local water security action plans. This platform should also include local NGOs, in order to secure a fair representation of local interests. The business sector should be more involved in water management (the majority of businesses are involved at the level of information supply) since they have power but are not always interested in water-related issues. Their good connections with foreign donors and international organisations should be used as an opportunity to address local and national water-related problems. One possible way to motivate them to be active players is through the establishment of public–private partnerships.

**Recommendations**

**Overall recommendations for interventions to improve the current situation**

*The context of water security*

A common understanding of water security at the local level is very important for future project implementation. Component 2 of the WATER SUM project should affirm the approach to water security as defined in the GWP declaration: that every person has access to enough safe water at affordable cost to lead a clean, healthy and productive life, while ensuring that the natural environment is protected and enhanced. The contextual scope of project implementation should encompass the state and evolution of seven main challenges for water security, as defined at the second World Water Forum (meeting basic needs; securing food supply; protecting ecosystems; sharing water resources; managing risks; valuing water; and governing water wisely). Our analysis reinforces the view that the security of access to water resources is, and will increasingly be, the crucial problem at the local level in MENA countries. It is therefore advisable to employ a so-called developmental approach to addressing water security during project implementation. This approach typically seeks outcomes, in the form of goals and targets, through a combination of policies, reforms and investment projects.
Recommendation 1. WATER SUM Component 2 should affirm the approach to water security as defined in the GWP declaration. Local water security issues should be addressed using a so-called developmental approach, which is based on developmental planning in the form of goals and targets, through a combination of policies, reforms and investment projects.

Territorial scope of the project

According to this analysis, in two of the eight analysed countries covered by the project document (Syria and Libya) it is not currently possible to implement project activities due to war operations and serious security threats. Algeria, Egypt and Lebanon are still characterised by a fragile economic and, more importantly, political situation and are exposed to certain security risks due to regional conflicts and internal tensions. However, anticipated project activities should not encounter major problems due to political and economic constraints in Morocco, Tunisia and Jordan. Moreover, a water-related indicator-based assessment indicates that Jordan is the most suitable country of the six analysed for WATER SUM Component 2 interventions in relation to water security issues, with Tunisia ranked second and Morocco third. All three countries have a higher rank in the context of government performance than the other ranked countries, which indicates their relative political stability and accountability, and the quality and effectiveness of the legal base.

Recommendation 2. It is highly advisable to adjust the original territorial scope of WATER SUM Component 2 and to plan project implementation in countries where project activities will not encounter major political and security obstacles, while project results will bring more efficient, accountable and sustainable effects with fewer efforts on the part of stakeholders. To that end, and given the overall ranking according to indicator-based benchmarking, Jordan, Tunisia and Morocco (in that order) should be considered as the most appropriate countries from among the eight analysed. Algeria, Egypt and Lebanon (in that order) should be considered as appropriate for project interventions, but with certain risk of political, institutional and other obstacles that may occur during project implementation. Syria and Libya should be considered as not appropriate for project implementation.

Institutions and policies

Developing the institutional and policy arrangements for water security management at the local level in MENA countries has long been a necessary reform. From the current baseline situation, it is clear that reaching the level of institutional capacity and resources needed for the development of the local water sector in MENA countries will be a profound step change, and a necessary precondition for the effective management of the growing water crisis.
Recommendation 3. WATER SUM Project Component 2 should contribute to the development of water security–related policies at the local level in selected MENA countries, including the improvement of the institutional set-up at the local level, if and when needed. This should include (but should not be limited to) the development of local competencies in: (1) setting local water management policy, including objectives and targets; and (2) developing, implementing and updating local water security action plans.

Our analysis clearly demonstrates that decision making in water-related issues in the majority of MENA countries covered by the study is highly centralised. Project implementation should therefore be planned and coordinated with the higher tiers of government, and especially with responsible ministries and regional governments. This is particularly the case in Jordan, Tunisia and Egypt, but also in Morocco.

Recommendation 4. Given that the government systems in most MENA countries are strongly hierarchical in terms of power sharing, with limited decentralisation, all project activities should be carefully planned and coordinated with the central government. Additional efforts should be made in order to best position project activities within the current framework of ongoing central government activities and strategic intentions (particularly in the framework of European Neighbourhood programmes; projects supported by the WB and AfDB; regionalisation, decentralisation and public administration reformsetc.).
Recommendation 5. It is crucially important to establish clear links with higher tiers of water-related governance from the beginning of project implementation, through: (1) the establishment of a project steering committee comprising high-level representatives of responsible ministries from each country; (2) the establishment of local water security advisory committees in each selected local unit, consisting of (i) representatives of the regional government (governorates in Jordan and Tunisia, governorates and regions in Egypt, and provinces in Morocco); (ii) representatives of territorial water management institutions (JVA or WAJ in Jordan, CRDAs in Tunisia, ABHs in Morocco); and (iii) representatives of local stakeholder groups. The role of the local water security advisory committee will be to monitor all planning and implementation activities at the local level, and to provide better links with national water institutions.

As presented in our analysis, the MENA countries covered by this study have developed a wide strategic and regulatory framework for water-related issues. Local water security activities should be planned and implemented in line with national water strategies and master plans, as well as with regional or river basin plans.

Recommendation 6. All project activities, and particularly local water security action planning, should be fully harmonised with the existing national and regional (including river basin) strategic and regulatory framework. It is therefore advisable to carry out a more in-depth analysis of national and regional water strategies and master plans in countries selected for project implementation, and, based on the findings, to supply local project teams with a “catalogue” of the policies and measures provided in those documents with respect to local water security. This will certainly be a useful tool for local water security planning and, at the same time, will ensure harmonisation.

Institutional aspects of delivering effective support to project partners

The water sector in all the analysed countries is more or less characterised by centralised systems with a strong hierarchical top-down balance of power. However, local government systems vary case by case in the analysed countries. It is therefore highly important to make wise decisions regarding the most appropriate level of local government for project intervention in each particular country. The analysis of local responsibilities and power presented in Chapter III, and the analysis of local case studies presented in Annex 1, suggest that most appropriate levels of local government are as follows:
• **Jordan**: The project should be implemented in category 1 municipalities (governorate centres and any other municipality with a population exceeding 100,000), despite the fact that municipalities are formally not seen as local public entities with broader local responsibilities. However, (1) the municipal level is the only level of government with an elected mayor and executive council that can be instrumentalised for a participative local planning process; (2) municipalities in other categories are smaller in size than category 1 municipalities, and therefore have lower internal capacities; and (3) some encouraging efforts and innovative practices observed in Jordanian municipalities that are traditionally inert in planning, such as the establishment of a participative mechanism in Al Karak. All of the above indicates that the results of project activities will be more effective in the biggest municipalities. All three category 1 municipalities analysed in case studies (Jerash, Al Karak and Al-Salt) seem to be good candidates for inclusion in project implementation.

• **Tunisia**: Municipalities are legally independent from the central government. They have their own capital and budget and are governed by a directly elected council, but have limited functional responsibilities and lack decision-making powers, especially on water issues. However, the new constitution acknowledges the need for functional decentralisation, and municipalities are seen as seeds for this process. Although the level of public participation in planning and decision making is still very low, the history of municipal planning in Tunisian municipalities and the role of executive councils can be used as common ground for future project interventions. The best results from project interventions should be achieved in medium-sized municipalities (up to 130,000 inhabitants).

• **Morocco**: Project implementation should be fruitful at the level of municipalities (communes), or urban municipalities (communes urbaines). Required by law from 2009, local development plans have become the principal planning tool at the level of municipalities, and the commune council is empowered to define the plan. Local self-governments are also increasingly resorting to partnerships with public and private entities to manage the delivery of public services. Communes and communes urbaines also have the right to take any action in the form of cooperation, association or partnership that helps to promote their development.

• **Egypt**: The project should be implemented at the level of cities. However, local planning in Egypt is very limited due to the high level of centralisation and the complicated issue of power (five tiers, each of which includes two “legally” independent bodies but that together represent the executive authority). The structure of stakeholders should therefore be carefully defined.
**Recommendation 7.** WATER SUM Component 2 should be implemented as follows: (1) in Jordan at the level of category 1 municipalities (governorate centres and any other municipality with a population exceeding 100,000); (2) in Tunisia at the level of municipalities in medium-sized municipalities (up to 130,000 inhabitants); (3) in Morocco at the level of municipalities (*communes*) or urban municipalities (*communes urbaines*); and (4) in Egypt at the level of cities.

**Selection of municipalities**

**Recommendation 8.** The selection of local governments to be supported under WATER SUM Component 2 should be open and transparent, based on the criteria outlined below. The selection process should be previously discussed with stakeholders at the national and/or regional level.
Recommendation 9. Local governments to be included as project partners should be selected on the basis of the following criteria:

- The size of the local community — that is, area and number of inhabitants. It is advisable to make a balance between bigger and smaller local units.
- The predominant characteristics of the local community (rural vs. urban municipalities). It is advisable to make a balance between predominantly urban and predominantly rural municipalities.
- The level of development of the local community. If possible, a balance between developed and underdeveloped local self-governments should be achieved when selecting local communities.
- Previous experience with strategic planning and donor assistance programmes. It is recommended that at least half the selected municipalities have previous experience with strategic planning and/or donor assistance.
- The existence of good practices in the municipality. Preference in the selection should be given to municipalities that already have or that are already implementing good practices or projects in water management.
- The existence of local actors capacitated to deal with strategic planning (good local government, good links with regional and central authorities, active and respectable NGOs, public interest etc.).

Methodology for local water security action planning

Recommendation 10. Local water security action planning should follow the methodology elaborated in Chapter VI: (1) water security status assessment; and (2) a planning and implementation phase. It is recommended to apply elements from both the WSSI and CWSI methodologies during the assessment phase, and to use the PDIA approach for the planning and implementation phase.

Recommendation 11. It would be very helpful to study carefully and learn from experience gained during similar previous projects and activities in the field (e.g. WB and USAID projects in the region, GIZ projects in Jordan and Morocco, and the EUWI-MED, SWIM-SM andEMPOWERS projects) and to include experts engaged in previous programmes and seek their advice. Moreover, cooperation with similar donor activities is of crucial importance.

The local water security action planning process should be based on comprehensive stakeholder identification. This phase of the process should be considered as very important, given the situation in water management in most of the countries covered by the study, as described below.
**Recommendation 12.**  It is recommended to undertake a stakeholder analysis for each country selected to participate in the project, using the methodology provided in this report. The results of such an analysis will form the basis of the stakeholder analysis at the municipal level — that is, the local stakeholder analysis as a part of the methodology for local water security action planning will be carried out far more easily and the results will be considerably unified.

**Recommendation 13.**  “Key players”, particularly line ministries in charge of water, must be involved in the process from the very beginning since they have high levels of both power and interest, with good links to all other major stakeholders in the governmental, academic and private sectors.

**Recommendation 14.**  Governmental authorities are well positioned on the “power versus interest” diagram, but their relations with other stakeholders should be strengthened. Local government is quite isolated and does not have direct contacts with other stakeholders dealing with water management. It is necessary to improve local government knowledge and skills regarding water management, which should contribute to their better involvement in the process and better connections with other water-related stakeholders.
Recommendation 15. In order to secure a successful participatory approach, it is necessary to include less-powerful stakeholders who nevertheless express significant interest — that is, small players. Academia is well positioned and is perceived as independent and evidence based, thus it should play an important role in information exchange through its training and consulting services. Academia can play a better intermediary role as a knowledge broker between all groups of stakeholders. Non-governmental organisations that represent the public interest with respect to environmental concerns have a good knowledge of water management issues and obtain all the crucial information from the main governmental stakeholders. However, they are not well connected among themselves, thus it is advisable to establish a platform for their cooperation for the purposes of developing LWSAPs. This platform should also bring together local NGOs in order to secure a fair representation of local interests. The business sector should be more involved in water management (the majority of businesses are involved only at the level of information supply), since they have power but are not always interested in water-related issues. Their good connections with foreign donors and international organisations should be used as an opportunity to solve local and national water-related problems. One possible way to motivate them to be active players is by establishing public–private partnerships.

Capacity building

The project document provides for a wide range of activities to strengthen planning and implementation capacities at the local level. It is important to build the capacities of local stakeholders to draft and implement LWSAPs in a transparent and open way; to explore potential for enhancing the role of communities to fight water scarcity and achieve sustainable development; and in parallel to enhance local skills (related to communication, project cycle management, facilitation and coaching techniques, knowledge dissemination etc.).
Recommendation 16. The capacity-building component should be considered as crucial. Local actors should be supplied with various types of training, as outlined below:

- Training of trainers for facilitators of LWSAP processes. Particular attention should be given to training on action planning and monitoring, including facilitation and coaching techniques.

- Training on water security at the local level for municipal decision makers (municipal senior management team). The training should familiarise top managerial structures with up-to-date facts and achievements in IWRM and water security and should raise their level of commitment to the concept. The optimal way is through the analysis of best practices during a study visit.

- In-service training for local experts and members of working groups. Local experts should be recruited from the region (or from the municipality itself) to work on situation assessment, the definition of priorities and the development of action plans and projects. They should be supported with methodological training. In addition, in-service training should be provided for members of the working groups.

- Training on project cycle management for municipal officers.

Grant component

Although direct financial support for the intervention should not be considered as the most important part of the project, previous experience in other regions shows that this component has always attracted considerable interest on the part of the local administration. This aspect of the project should therefore be carefully designed and implemented. As planned in the project document, financial support will be provided to target municipalities to implement the LWSAP concept and realise a certain number of selected priority actions identified during the development of their plans. (The support will be disbursed in the form of grants through a competitive process based on previously defined project scope and selection criteria.)

Recommendation 17. Preconditions for eligibility for Water SUM financial support should include the following: (1) the project should be defined as a priority in the LWSAP developed by the municipality; (2) there must be political commitment, in particular related to building up the necessary human resources and organisational set-up; (3) the preparation of planned projects should have achieved an appropriate level of maturity; and (4) suitable sites must be available (for hard investments).

Recommendation 18. If and when applicable, an ex ante impact analysis and analysis of effectiveness should be provided.
**Recommendation 19.** The budget allocated for the project pipeline is limited and is not currently sufficient to solve complex water security problems in local units. Local governments should be made aware of this from the very beginning of the project and requested to adjust proposals to the available means.

**Sustainability**

While the importance of the strategic planning process has gradually been recognised during the past few years, capacity-building activities have been extremely modest. Local governments, supported by the project, should find ways to make the self-assessment of water security–related knowledge and skills more realistic and to raise employees’ awareness of the need for intensive professional development.

**Recommendation 20.** WATER SUM Component 2 should consider the development of a local water security capacity-building plan in selected municipalities as one of the project activities. The capacity-building plan should be developed around two main components: (1) the development of “hard” skills — strategy development, management and execution, monitoring and evaluation, project management cycle, data analysis, instruments etc.; and (2) the development of a series of “soft” skills such as effective communication, public presentation, problem solving, consensus building, negotiation, team building and conflict resolution. Leadership training to support local governments, businesses and community leaders should therefore be included in the plan.

The sustainability of the project will be further reinforced if partnerships on local water security issues between local authorities, non-state actors, communities and the private sector continue to exist after the end of the project. This includes the exchange of information and expertise among local governments, formal inter-municipal cooperation through agreements between local governments, and cross-border cooperation.

**Recommendation 21.** It is highly recommended to establish a permanent structure for regional cooperation on local water security, as a seed for future collaboration across boundaries. Project interventions should be tailored to encourage such ways of cooperation. It is advisable to promote existing regional NGOs to act as a forum for local water security, through capacity building and the establishment of various mechanisms for cooperation. Further research is needed, but two regional organisations seem to be suitable for this activity: the Arab Integrated Water Resources Management Network (AWARENET); and the Arab Countries Water Utilities Association (ACWUA).
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Annexes

Annex 1. Case studies

Municipality of Greater Jerash, Jordan

General background

The municipality of Greater Jerash is located 46 km north of the capital city of Amman, at 600 m above sea level. The city is the capital of the Jerash governorate and has a population of approximately 45,000, while there are nearly 82,000 inhabitants in the municipality of Greater Jerash (2009). The city of Jerash (Jerash region) is the centre of the municipality, while the rest of the population belongs to Suf region (17,000), Deir Al-Liyyat (4,700), and Al-Kafeer (14,700). The municipality is a category 1 Jordanian municipality (see Chapter 3 for details). More than 50,000 Syrian refugees were settled in the Jerash area during 2013–2014. Since 2008, the city has hosted an annual public festival during two summer months, with 500,000 visitors.

The regional economy is predominantly based on tourism and agriculture, mainly livestock (chicken, sheep, goats and cattle), fruits and vegetables. Jerash is considered as one of the most important tourist attractions in Jordan, with the archaeological site of ancient Gerasa (one of the Decapolis cities) as the main tourist attraction. The proportion of the population living below the national poverty line is 20.3 percent, with unemployment at 11 percent.

The Jerash area is characterised by a variety of climatic conditions: it is partly a mountainous area, with precipitation ranging between 150 and 600 mm per year. Average annual rainfall is 393 mm. Rainfall varies from year to year, which has a direct impact on the agricultural sector.

Local development planning is mainly lacking, although the municipality of Jerash developed a short-term (three-year) local development plan in 2009 (http://ppru.net/wp-content/uploads/Jerash-Local-Dev-Plan.pdf). However, water issues were not considered as priorities in this plan.

Overview of water management challenges

Water supply resources in Jerash include 24 artesian wells with a capacity of 670 m³/hour, and 25 surface springs, mainly concentrated in Burma and Suf region. Of the over 200,000 inhabitants, only 75,000 are served by a sewerage network. The activated sludge WWTP in Jerash was opened in 1983. It was designed for a hydraulic capacity of 3,250 m³/day.
Since August 2012, influent wastewater has been diverted into Al Mera’d WWTP and the plant has been out of operation. Current planning calls for the Jerash WWTP to be demolished and a new treatment plant to be constructed.

The governorate of Jerash faces several water-related challenges and tensions, including:

- high natural population growth as well as population growth due to the influx of refugees, which are the main drivers for higher water demand;
- climate change and a lack of adaptation capacity;
- competition for water among sectors (tourism, agricultural and municipal); and
- the poor management of infrastructure and local resources.

The water service provider in the region is the publicly owned Al Yarmouk Water Company. Previously, water services were provided by the Northern Governorate Water Authority, which was incorporated into the Al Yarmouk Water Company in 2010 in order to obtain financial and managerial autonomy, improve organisational efficiency and reduce costs.

**Institutions and actors involved**

The main stakeholders involved in the area of Greater Jerash municipality are the MWI; the MoMA; the WAI; Jerash Governorate; the Municipality of Greater Jerash; Al Yarmouk Water Company; national NGOs; local community–based organisations; and donors. The following table lists the stakeholders according to their powers and interests.

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Water and Irrigation</td>
<td>Formulating strategy and policy; monitoring policy implementation.</td>
<td>Power to influence strategies and policies; securing of funds to implement projects.</td>
<td>Implementing the national strategy; meeting water demand.</td>
</tr>
<tr>
<td>Water authority</td>
<td>Monitoring of the performance of the service provider.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jerash Governorate</td>
<td>Facilitating the missions of municipalities.</td>
<td>Water-related social conflict resolution.</td>
<td>Meeting people’s demands; reducing social conflicts over water.</td>
</tr>
<tr>
<td>Municipality of Greater Jerash</td>
<td>Securing better services.</td>
<td>No significant power to monitor the service provider; mobilisation of the local community.</td>
<td>Guaranteeing credibility and reputation; regaining responsibility to manage water within its borders.</td>
</tr>
<tr>
<td>Ministry of Municipal Affairs</td>
<td>Upgrading the capacity of municipalities; monitoring the performance of the municipality.</td>
<td>No significant power in water management but power in securing funds for projects.</td>
<td>Expressing municipalities’ water needs in the cabinet; coordinating funds with relevant ministries.</td>
</tr>
<tr>
<td>Al Yarmouk Water Company</td>
<td>Providing services; collecting fees.</td>
<td>Power to influence water services.</td>
<td>Providing services; dealing with daily water problems.</td>
</tr>
<tr>
<td>National</td>
<td>Implementing small-scale</td>
<td>Power to raise water</td>
<td>Promoting the concept</td>
</tr>
<tr>
<td><strong>NGOs</strong></td>
<td>Projects; ensuring public awareness; building capacity.</td>
<td>Issues and mobilise the media to form public opinion with respect to water problems.</td>
<td>Of good governance; implementing pilot projects; being the voice of the people.</td>
</tr>
<tr>
<td>Local community-based organisations (CBOs)</td>
<td>Implementing small projects; participating in public awareness campaigns; training members of CBOs.</td>
<td>Power to get people’s voices heard.</td>
<td>Serving members better, in particular in agricultural cooperatives.</td>
</tr>
<tr>
<td>Elected area legislators</td>
<td></td>
<td>Big influence on policies and ministry.</td>
<td></td>
</tr>
<tr>
<td><strong>Donors</strong></td>
<td>Funding projects.</td>
<td>Institution’s legitimacy can be measured by amount of budget allocated to the area.</td>
<td>Sustaining livelihoods and water security; promoting cooperation with the population and government.</td>
</tr>
</tbody>
</table>

**Public participation and stakeholder involvement issues**

According to the findings of the field visit and interviews, public participation in water governance and management is very limited. No indicator shows that the municipality, governorate or service provider has conducted consultation sessions with the local community, NGOs or other stakeholders on managing water resources. Several complaints from the municipality and local community concerned lack of communication with the service provider. The municipality feels it has no power to meet people’s demands. On the other hand, the local community feels that there are no proper mechanisms for expressing their needs.

**Efforts and local initiatives**

Lack of capacity, the fragmentation of planning and management, and limited mechanisms for participation are the main drivers limiting local initiatives. The municipality has made some attempts to cooperate with the local community to protect water resources (e.g. rehabilitation and protection of springs), but these attempts have lacked proper planning and have demonstrated a weak vision of IWRM.

**Problem analysis**

Despite the fact that water shortages and increasing demand are the main issues, there is a lack of integrated management: very little effort has been made to address the increasing demand and to empower stakeholders to implement the national strategy at a local level. The main indicators illustrating the gap between the national strategy and existing practices in the municipality of Greater Jerash are:

- the inefficient use and lack of protection of local resources (it is estimated that almost 2 million m³ of spring water is not utilized yet, or is utilized with a limited capacity);
- very strong population pressure on water resources, due to forced migration and seasonal variations (local summer festival);
• limited community participation and the absence of institutionalised mechanisms for dialogue;
• the limited role of NGOs (no official attempts to strengthen community-based water management, in particular in the agricultural sector); and
• scattered and fragmented institutional tasks (in particular the maintenance and rehabilitation of water supply for domestic and agricultural use).

Conclusions, including the relevance of the local context

The institutionalisation of community participation by strengthening relationships among all stakeholders is necessary, and the governorate can accommodate this dialogue. Community-based planning capacity is limited and needs to be enhanced. The sustainable water security concept is insufficiently promoted, in particular taking into consideration water scarcity tensions, trends and transitional measures. The linkages between community-based water management (on the ground) and national strategy are not sufficiently clear.

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>108.5 km²</td>
</tr>
<tr>
<td>Population</td>
<td>200,000, with a non-natural increase (refugees) and a seasonal increase (at festival time)</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | • Increasing demand  
• Irregularity of water services  
• Competition among different sectors  
• Lack of public participation in planning  
• Fragmentation of institutions |
| Competition for use of natural resources | Due to rapidly increasing demand for domestic and tourism-related use, and for family-based agriculture, the main competition for natural resources use is related to:  
1. meeting the demands of different sectors;  
2. the compromise between livelihoods, food security and tourism;  
3. rapid urbanisation at the expense of agricultural land; and  
4. the overexploitation of natural resources, mainly groundwater. |
| Degradation of natural resources     | Overexploitation of groundwater resources due to the high number of illegal wells.                                                                                  |
| High vulnerability                   | The community is, and will increasingly be, highly vulnerable to insufficient food security, water-related social conflicts and human insecurity (e.g. environmental migration due to climate change). |
| Strong local partners with good knowledge of pressing issues | NGOs and local authority |
| Established networks with stakeholders and authorities | Very weak and non-institutionalised dialogue |
| Recently completed and current projects | • Jerash Camp WATSAN project  
• Rehabilitation of part of the water supply network |
Municipality of Al Karak, Jordan

General background

Al Karak is situated on a hilltop about 939 m above sea level, 140 km to the south of Amman, covering an area of 3,495 km$^2$. It is the capital of Karak governorate (which had an estimated total population of 350,000 in 2015). The population of Al Karak municipality is nearly 68,810 (20,000 in the city of Al Karak). Most of the city's population are Muslims (75 percent), and there is also a significant Christian population (the biggest in Jordan at 25 percent).

The municipality of Al Karak is a category 1 Jordanian municipality (see Chapter 3 for details).

Al Karak has a semi-arid climate with temperate cold and warm seasons. August is the warmest month, with an average temperature of 31.5 °C at noon. January is the coldest month, with an average temperature of 3.1 °C at night. Rainfall varies in the range of 100 to 300 mm/year and has no distinct peak month. The landscape is mostly covered with sparse vegetation. The soil in the area is high in calcisols, cambisols and luvisols, and is dominated by calcium carbonate as powdery lime or concretions.

Despite the fact that the area is home to some companies (e.g. the Arab potassium company and Dead Sea chlorides-related companies), incomes in Al Karak are only around 46.8 percent of the Jordanian average per capita income, while the poverty rate (40 percent) and unemployment rate (15 percent) are relatively high. Income distribution inequality is higher than average in Jordan. The main economic activity is agriculture, and some inhabitants are employed in administration.

Overview of water management challenges

Al Karak municipality is located in Wadi Al-Karak Basin, one of the most important basins in Jordan. With a total area of 190.7 km$^2$, it represents the transitional area between the humid/semi-arid areas in the west and the drought highlands in the east.

Karak governorate produces a total of 20 million m$^3$ of water per year. The per capita share of water is 172 litres a day, which is slightly above the national average (144 litres/day). Water is supplied from natural springs and groundwater. Springs (46 in total) are important sources of water in Wadi Al-Karak Basin, whether for domestic or agricultural exploitation, producing 18 million m$^3$ per year in total. (Springs with a higher capacity are Ein Sara, with 62,300 m$^3$ per month; and Mahtah Ghuwair with 242,500 m$^3$ per month.) Irrigation is provided primarily from springs.

The water supply network is old and in chronic need of better maintenance. As network pipes are made of iron they frequently break due to rust, causing the flooding of
basements. The rate of households connected to piped water supply is very high (99 percent). However, water pressure is low in the summer.

Water pollution is an important issue in Al Karak. According to monitoring results, one of the two biggest springs, Ein Sara, is polluted mainly due to lack of planning and control by the authorities. Water sources are not effectively protected.

As in other parts of Jordan, there is competition among water users in Al Karak. Besides competition between domestic and agricultural use, Al Karak also faces competition among livestock farms and farmers. Livestock breeders use drinking water to fill the sterilisation pools for their own livestock, causing a shortage in the amount of water delivered to farmers.

The total length of the existing sewerage network in Al Karak is about 37 km. Sewerage networks cover less than one-third of the territory of Al Karak, and only 20 percent of households are connected to the sewerage network. A parallel system is therefore in place, based on household-level septic tanks that are emptied by wastewater trucks, which supposedly discharge to existing WWTPs.

Al Karak WWTP, which uses the trickling filter process, has been in operation since 1988. It was designed for a hydraulic capacity of 875 m$^3$/day. The average influent flow rate received in 2012 was about 1,850 m$^3$/day, which means that the plant is overloaded hydraulically. The new Adnaneyeh WWTP was built in 2013 with a capacity of 7,060 m$^3$/day, to serve residents of Al Mazar, Mutah and Adnaneyeh, as well as several villages in Karak.

The main challenges in the water sector in Karak governorate include:

- the low rate of connection to the sewerage network, particularly in rural areas, while alternative wastewater disposal systems based on septic tanks lead to the spread of insects, rodents and odours, especially in summer;
- a lack of drinking water and intermittent piped water supply. Despite extensive network coverage, the public continues to rely overwhelmingly on non-public water to meet drinking water needs. Fewer than half of households with access to the piped system ("connected" households) use public water as their primary drinking water source, with no significant difference between the proportion of rural and urban connected households. The remaining households mainly depend on bottled water;
- frequent droughts as a result of the lack of precipitation and climate variability;
- an increase in the proportion of livestock water consumed, especially in the summer, forcing livestock breeders to buy water at high prices and resulting in a reduction in the physical yield of livestock; and
- a lack of quality services provided by the municipality.
### Institutions and actors involved

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Powers</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Water and Irrigation</td>
<td>Formulating strategy and policy; monitoring policy implementation.</td>
<td>Influence on strategies and policies; securing of funds to implement projects.</td>
<td>Implementing national strategy; meetingwater demand.</td>
</tr>
<tr>
<td>Karak Governorate</td>
<td>Facilitating the missions of municipalities.</td>
<td>Resolution of water-related social conflicts.</td>
<td>Meeting people’s demand; reducing social conflicts over water.</td>
</tr>
<tr>
<td>Municipality of Karak</td>
<td>Securing better services.</td>
<td>No significant power to monitor the service provider; mobilisation of the local community.</td>
<td>Guaranteeing credibility and reputation; regaining responsibility to manage water within its borders.</td>
</tr>
<tr>
<td>Ministry of Municipal Affairs</td>
<td>Upgrading the capacity of municipalities; monitoring the performance of municipalities.</td>
<td>No significant power in water management but powers related to securing funds for projects.</td>
<td>Expressing municipalities’ water needs in the cabinet; coordinating funds with relevant ministries.</td>
</tr>
<tr>
<td>National NGOs</td>
<td>Implementing small-scale projects; raising public awareness; building capacities.</td>
<td>Power to raise water issues and mobilise the media to form public opinion in relation to water problems.</td>
<td>Promoting the concept of good governance; implementing pilot projects; being the voice of the population.</td>
</tr>
<tr>
<td>Local community-based organisations (CBOs)</td>
<td>Implementing small projects; participatingin public awareness campaigns; training members of CBOs.</td>
<td>Voicing public opinion.</td>
<td>Serving their members better, in particular in agricultural cooperatives.</td>
</tr>
<tr>
<td>Elected area legislators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advisory Board</td>
<td>Providing advice to municipality; participating in planning.</td>
<td>Has a good reputation and power.</td>
<td>Representing the people.</td>
</tr>
<tr>
<td>Donors</td>
<td>Funding projects.</td>
<td>Institutions’ legitimacy can be measured by amount of budget allocated to the area.</td>
<td>Sustaining livelihoods and water security; promoting cooperation with the population and government.</td>
</tr>
</tbody>
</table>

### Public participation and stakeholder involvement issues

Al Karak municipality is one example of good public participation in water planning, despite the fact that municipalities in Jordan have only a marginal role in water planning and management. The municipality created an advisory board as a platform for dealing with all services-related issues, including water-related problems. This institutionalised multi-stakeholder platform has a good impact on the legitimisation of the public’s
demands and on dialogue with central government. Through extensive consultations between municipal authorities and local community–based organisations and NGOs, the community has been able to express its needs.

Al Karak municipality has a very active Advisory Board. Members of the board are representatives of young people, women and farmers, local experts, respected members of the community and representatives of NGOs. The purpose of the Advisory Board is to help the municipality in local planning and create an effective platform for expressing community needs to central government. The board recently organised an agricultural conference to discuss the problems facing the agricultural sector at governorate level. Most of the conference outputs were endorsed by the Jordanian Government, and some are already in the implementation phase.

Efforts and local initiatives
Al Karak municipality has launched numerous local initiatives in cooperation with local NGOs, such as joint activities with Wadi Al-Karak Water Users Association to address the rehabilitation of damage following the 2015 storms and floods. The municipality is involved in regular activities with youth and women’s organisations.

Problem analysis
Al Karak municipality faces the problems of increasing demand for water for domestic needs and poor wastewater infrastructure in rural areas. In addition, the irrigation canals are old and have high losses, despite the existence of many springs in Wadi Al-Karak. Water use efficiency is very low.

Conclusions, including the relevance of the local context
The municipality of Al Karak is a good example of how local authorities in the Jordanian context can rely on the community to engage all representatives in planning. The municipality uses community participation as a tool for local planning, and as an instrument for lobbying and advocacy. With some additional capacity-building efforts, these mechanisms will be able to demonstrate that water planning at the local level in a highly centralised country like Jordan can be efficient and sustainable.

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>3,500 km²</td>
</tr>
<tr>
<td>Population</td>
<td>350,000</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | Over-pumping from groundwater wells  
Neglected or poorly protected springs  
Poor infrastructure for water and wastewater  
Institutional fragmentation  
Increasing water demand |

<table>
<thead>
<tr>
<th>Competition among users of natural resources</th>
<th>Competition between agricultural and domestic demand.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degradation of natural resources</td>
<td>Overexploitation of groundwater.</td>
</tr>
</tbody>
</table>
| High vulnerability                            | Groundwater pollution.  
Salinisation of groundwater. 
| Strong local partners with good             | Municipal Advisory Board is a very strong actor in lobbying |
knowledge of pressing issues and advocacy towards central government.

| Established networks with stakeholders and authorities | • Municipality has good capacity for participatory planning (in the Jordanian context).  
| • Municipality has a strong vision and belief in community-based water governance.  
| • Municipality has established an efficient network with local community–based organisations. |
Municipality of Greater Al-Salt, Jordan

General background

Al-Salt is the administrative centre of the Balqa governorate in north-western Jordan. It is a category 1 Jordanian municipality (see Chapter 3 for details). Al-Salt is located some 28 km west of the capital. The Greater Salt municipality is home to about 97,000 inhabitants (2006), 65 percent of whom are Muslims and 35 percent Christians. The city itself, which covers an area of 48 km², constitutes 61 percent of the area of Greater Al-Salt municipality, which has a population density of 1,605 inhabitants/km². The area has a moderate climate as a result of its high elevation (900 m) and the impact of the Mediterranean Sea. The climate is characterised by hot, dry summers and cool, wet winters, with two short transitional periods in between. High temperatures, low relative humidity and high evapotranspiration also characterise the dry period, while moderate temperatures and high relative humidity of about 80 to 90 percent characterise the wet period. Mean annual precipitation ranges between less than 350 mm to more than 525 mm.

Prevailing economic activities include agriculture and tourism. Al-Salt is famed in Jordan for its fertile soil and the quality of its fruit and vegetable harvests, particularly olives, tomatoes, grapes and peaches. An ancient town, Salt was once the most important settlement in the area between the Jordan Valley and the eastern desert, and today the tourist economy benefits from Al-Salt’s history. The population of Al-Salt is mainly employed in agriculture and public administration. However, socioeconomic indicators show that the proportion of the population living above the national poverty line is as high as 21 percent, accompanied by a high income inequality rate of 33 percent.

Overview of water management challenges

Like other parts of Jordan, the Balqa governorate, and Al-Salt municipality in particular, faces increasing water demand due to population growth and a high urbanisation rate. The main source of water is groundwater, and partially water harvesting. Al-Salt is geographically located in the Wadi Shueib sub-catchment of the Lower Jordan River. A number of wells have been drilled in the Wadi Shueib, especially in the area around Al-Salt, most of them for drinking water production for local communities. However, many of the wells have already been inactive for a long period due to the regular occurrence of high nitrate concentrations. The only remaining active well that is used for direct supply is Salt Municipality Well 4, which has an average productive yield of about 0.33 million m³/year. Al-Salt municipality is also supplied from Yazidiyya well during periods of high demand.
Springs have traditionally been, and often still are, the primary water supply in the Jordan Valley side wadis. There are 27 registered springs emerging in the Wadi Shueib catchment area (three of them supplying Al-Salt municipality), of which 21 have reported discharges for the 2000–2010 period, while the rest have apparently run completely dry.

Different studies have found that the aquifers in the Wadi Shueib area are particularly susceptible to pollution from domestic sewage leakage, showing high concentrations of nitrates and microbiological contamination.

The sewerage network covers 63 percent of households. The Salt Water Treatment Plant can provide a total of 6.5 million m$^3$/year of potable water, but often runs at a reduced service level due to the limited spring discharges, especially in summer months.

The water service provider is the Jordan Water Authority.

The main challenges for the water sector in Al-Salt municipality include:

- increasing water demand due to population growth;
- climate change impacts in the future;
- drought and rainfall variability;
- high potential evapotranspiration;
- surface water resources and groundwater pollution;
- insufficient capacity in the local community to deal with water management issues; and
- the fragmentation of task distribution among service providers.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Water and Irrigation</td>
<td>Formulating strategy and policy; monitoring policy implementation</td>
<td>Power to influence strategies and policies; and to secure funds to implement projects.</td>
<td>Implementing the national strategy; meeting water demand.</td>
</tr>
<tr>
<td>Balqa Governorate</td>
<td>Facilitating the mission of municipalities.</td>
<td>Resolution of water-related social conflicts.</td>
<td>Meeting the public’s demand; reducing social conflicts over water.</td>
</tr>
<tr>
<td>Municipality of Al-Salt</td>
<td>Securing better services.</td>
<td>No significant power to monitor the service provider; power to mobilise the local community.</td>
<td>Guaranteeing credibility and reputation; regaining responsibility to manage water within its borders.</td>
</tr>
<tr>
<td>Ministry of Municipal Affairs</td>
<td>Upgrading the capacity of municipalities; monitoring the performance of municipalities.</td>
<td>No significant power in water management but in securing funds for projects.</td>
<td>Expressing municipalities’ water needs in the cabinet; coordinating funding with relevant ministries.</td>
</tr>
<tr>
<td>National NGOs</td>
<td>Implementing small-scale projects; raising public awareness; building capacities.</td>
<td>Power to raise water issues and mobilise the media to form public opinion related to</td>
<td>Promoting the concept of good governance; implementing pilot projects;</td>
</tr>
</tbody>
</table>
Public participation and stakeholder involvement issues

The impression obtained from the field visit is that there is no efficient and effective public participation in Al-Salt, despite the fact that the area has several active youth and women’s NGOs and a strong scientific community. The level of involvement in water management planning is low, mainly due to the absence of an appropriate platform for water-related discussions.

Efforts and local initiatives

Local initiatives are currently very limited and constrained to the rehabilitation and maintenance of the local water network. Planning initiatives at local level are entirely lacking.

Problem analysis

The following problems were identified in Al-Salt:

- a shortage of water resources;
- low coverage of the sewerage network;
- top-down implementation of instructions;
- a strong hierarchy in water management, limited autonomy in planning and limited communication with end users;
- lack of communication between water stakeholders and limited capacity for the facilitation of stakeholder interaction;
• an emphasis on troubleshooting and complaint management;
• high water losses from the network and low water use efficiency; and
• the illegal use of water.

Conclusions, including the relevance of the local context

• Al-Salt municipality has a minor role in water management and planning, and dialogue between the municipality and the water authority is limited to maintenance and the repairing of damage. The role of the municipality in long-term planning is neglected.
• Areas without a sewerage network are major sources of groundwater pollution.
• Local community participation is very limited and has no significant impact on overall water planning and governance, despite the fact that the potential for participative planning largely exists.

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>1,119 km²</td>
</tr>
<tr>
<td>Population</td>
<td>140,000</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | • Shortage of water resources  
• Low coverage of sewerage network  
• High water losses from network and low water use efficiency  
• Illegal use of water                              |
| Competition for use of natural resources | Competition between agriculture, tourism and domestic demand.                                            |
| Degradation of natural resources         | Pollution from domestic sewage leakage, with high concentrations of nitrates and microbiological contamination. |
| High vulnerability                       | • Water shortage  
• Groundwater pollution                                                                                     |
| Strong local partners with good knowledge of pressing issues | • NGOs and community-based organisations, although capacities are insufficient and more capacity-building activities are needed  
• Scientific community (two universities)                                                                      |
| Established networks with stakeholders and authorities | No institutionalised network or platform for dialogue, despite the fact that NGOs and CBOs exist.        |
| Recently completed and current projects  | Water loss reduction initiative is ongoing.                                                              |
Municipality of Allan, Jordan

General background

The municipality of Allan is part of Al Balqa governorate and is a category 3 Jordanian municipality (municipalities of sub-district centres and municipalities with a population that exceeds 5,000 but does not exceed 15,000. Administratively, Allan is one of the nine districts of Greater Al-Salt municipality. It covers an area of 3.8 km² and has a total population of around 12,000 people. The district is located north-west of Amman, between hilly areas and the Jordan Valley, and is traditionally the local agricultural area. Allan district is currently developing very fast due to its attractiveness as a cottage settlement.

The district of Allan is located in a semi-arid area, with a diverse climate. Precipitation ranges between 150 mm and 450 mm. The main economic activity is agriculture, and the main crops are vegetables and fruit trees. Allan district is a pocket of poverty, with 30 percent of the population living below the national poverty line and a very high unemployment rate (27 percent).

Overview of water management challenges

The main source of water in Allan district is groundwater, and partially water harvesting. The primary water uses are domestic, livestock and garden irrigation. The rate of groundwater abstraction exceeds the safe yield, which has resulted in overexploitation. The shortfall in supply is met by the over-pumping of groundwater. There are currently two groundwater springs in Allan for local water supply (no reliable data regarding capacities are provided), one of which is heavily polluted from sewerage water and therefore unfit for use for freshwater purposes. As a consequence, water supply via the public network reaches households only once or twice a week. All households therefore have storage tanks large enough to store water for at least one week. The intermittent supply leads many households to rely on bottled water or private water tankers, which is about 8 to 10 times more expensive than public piped water.

Allan district has a limited sewerage network system to collect the wastewater generated by households, with fewer than 10 percent of households connected. The majority of households discharge their wastewater into inappropriately designed and poorly managed cesspools (septic tanks), which are considered as one of the major sources of contamination of groundwater. Septic tanks in the Jordanian context are sealed underground tanks for wastewater collection, without any outlet pipe or scum/sludge retention system. The tanks are designed to be emptied frequently by wastewater trucks.
The most relevant feature of these septic tanks is that they are completely or partially unlined, allowing wastewater to seep into the ground.

The water and sewerage networks are old and in constant need of maintenance and repair. The field survey showed that one of the biggest problems for Allan district is the overlapping of responsibilities for repairing the water and wastewater networks. Coordination between the municipality and the water authority is very weak in terms of the maintenance and rehabilitation of the network. The district itself has neither the responsibility nor the funds for this purpose. The main responsibility lies with governorate public institutions. It is sometimes not clear which maintenance institution is responsible for repairing the network. Also, it is common for two different authorities to be involved in the repair (one repairs the network and the other repairs the local roads after the intervention), which results in poor coordination and problems in service provision.

As stated above, drinking water pollution, mainly from cesspools and agriculture, is increasing.

Allan district is governed by an administration that is understaffed and that has limited capacity to deal with water security-related issues. The pollution of springs in Allan is a clear indicator of poor water governance.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Water and Irrigation</td>
<td>Formulating strategy and policy; monitoring policy implementation.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Balqa Governorate</td>
<td>Facilitating the missions of municipalities; resolving water-related social conflicts.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Water Authority of Jordan</td>
<td>Supplying water and maintaining springs and network.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>District authorities</td>
<td>Mobilising the local community; securing better service.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Local community</td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Farmers</td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

**Public participation and stakeholder involvement issues**

Water governance-related dialogue among stakeholders is limited. There is no awareness of public participation, either in the community or in the administration. Complaints from the community are not properly addressed due to the lack of appropriate mechanisms. The field survey, and observations of the status of the water and wastewater networks, make it clear that the local community and CBOs do not make a lot of effort to raise public awareness regarding the protection of natural resources.

**Problem analysis**

The following problems were identified in Allan:

- limited water supply, as water is not sufficient to meet demand;
- the over-pumping of groundwater;
• limited accessibility to irrigation water;
• low rate of households connected to improved sanitation;
• spring depletion and contamination; and
• high water losses due to old network and illegal use.

Conclusions, including the relevance of the local context

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>3.8 km²</td>
</tr>
<tr>
<td>Population</td>
<td>12,000</td>
</tr>
<tr>
<td>Specific water security–related problems identified</td>
<td>• Limited water supply, as water is not sufficient to meet demand</td>
</tr>
<tr>
<td></td>
<td>• Over-pumping of groundwater</td>
</tr>
<tr>
<td></td>
<td>• Accessibility to irrigation water</td>
</tr>
<tr>
<td></td>
<td>• Low rate of households connected to improved sanitation</td>
</tr>
<tr>
<td></td>
<td>• Spring depletion and contamination</td>
</tr>
<tr>
<td></td>
<td>• High water losses due to old network and illegal use</td>
</tr>
<tr>
<td>Competition for use of natural resources</td>
<td>Not significant.</td>
</tr>
<tr>
<td>Degradation of natural resources</td>
<td>Heavy pollution of springs.</td>
</tr>
<tr>
<td>High vulnerability</td>
<td>• Water supply</td>
</tr>
<tr>
<td></td>
<td>• Public health</td>
</tr>
<tr>
<td>Strong local partners with good knowledge of pressing issues</td>
<td>None.</td>
</tr>
<tr>
<td>Established networks with stakeholders and authorities</td>
<td>No record of such.</td>
</tr>
<tr>
<td>Recently completed and current projects</td>
<td>Minor activities to reduce leakage and rehabilitate the water network.</td>
</tr>
</tbody>
</table>
Municipality of Medenine, Tunisia

General background

The municipality of Medenine is the administrative centre of Medenine governorate in south-eastern Tunisia. Medenine covers 55 km² and has a total population of 61,000 (according to the last census in 2004), or 14 percent of the total population of the governorate. The population density is 1,122 inhabitants/km². Medenine governorate is predominantly urban: the rate of urbanisation was 77 percent in 2004.

The unemployment rate in the Medenine governorate is among the lowest in Tunisia (10.3 percent). The poverty rate is 1.3 percent, which is far below the national average. The road network is well developed and infrastructure is easily accessible.

Tourism and services are the foremost economic activities in the governorate, and services prevail in the economy of the city of Medenine. Other economic activities in Medenine revolve around the tourism industry, specifically arts and crafts, services and construction. The agricultural sector contributes around 25 percent to the economy of the governorate. Agriculture is dominated by a nomadic pastoral system. However, in the Medenine area agricultural activities are becoming increasingly diverse, to include breeding and fishing. The rise of the tourism industry has led to the valorisation of agricultural products for agribusiness, especially olive production and the processing/packaging of marine products. Industrial activities have been limited due to the absence of a favourable industrial environment, a lack of local investment and high transportation costs. In addition, agriculture in Medenine governorate suffers from desertification, a lack of water, the marginalisation of pasture lands, low productivity and competitive markets.

The Medenine governorate area has extreme climatic conditions. It is an arid zone with an annual average temperature of 22°C. July has the highest average temperature (29.9°C) and January the lowest (10.6°C). Low rainfall is highly variable temporally and spatially and rain can fall over short periods at high intensities. The average annual rainfall ranges between less than 100 mm inland to around 200 mm in the mountains and coastal areas, which is well below the national average (336 mm). The wet season stretches from November to February, while the summer months of June, July and August are nearly rainless. Winds from the east/north-east are cold and wet, and are frequent in winter. Winds from the south-east, known as Chhili or Guebli, are hot and frequent in summer and increase the evapotranspiration rates and soil erosion.
Overview of water management challenges

Surface water is scarce and groundwater is overexploited in Medenine. Total water availability in the Medenine governorate is estimated to 116 million m$^3$ per year, of which 65 percent is used.

The city of Medenine is supplied first by Bir Mgarine (0.05 m$^3$/sec), because of the lower cost, and secondly by groundwater from Zeuss Koutine aquifer. Currently, Zeuss Koutine is the principal resource used for drinking water to supply the municipality of Medenine (98.5 percent of water is used for household purposes). Three main well fields in the Zeuss Koutine aquifer (Zeuss, Koutine and Hir Frej) supply the region with an average daily volume of 53,000 m$^3$. From the total water flow, Medenine uses 0.42 m$^3$/sec. Although monthly variations occur, the average monthly supply to Medenine municipality in winter 2010 was 320,000 m$^3$, while in the summer months it reached 490,000 m$^3$.

Two-thirds of water resources in the region of Medenine have a very high salinity, at 5 grammes per litre.

Medenine city is served by a water network operated by SONEDE, which is filled from the above-mentioned aquifers. Rural areas are also partially served by the SONEDE-operated network, and also by collective supply from standpipes and a few private counters (GIC El Guettar), including the sale of water from tanks. Remote households are supplied from underground tanks (majel, fesguia).

The proportion of households connected to piped water supply in Medenine is high. According to 2004 data from the National Institute of Statistics, the total proportion was 87.30 percent (95.30 percent in urban areas; 47 percent in rural areas). An additional 3.3 percent of households (15.5 percent in rural areas) are served with public water (considered as an improved water source). However, the rate of connection to sewerage systems is among the lowest in Tunisia (only 14 percent in total; 17.8 percent in urban areas)(data from the 2004 census).

Since 2000, Medenine has had a wastewater treatment plant based on activated sludge technology, with a capacity of 4,000 m$^3$/day. However, only 1,000 m$^3$/day are reused and the remainder discharged.

Deep water tables are badly affected by changes in land use and land-use practices, as well as by increasing water demand. Zeuss-Koutine aquifer is exploited by SONEDE, which uses 13 of the 17 deep wells with an extraction rate of 407 litres/sec, representing 98.5 percent of the permitted extraction rate. Surface water tables (in particular Oued Oum Zessar) are also in a poor state due to the rapid extraction of water.

Mainly because of public policies in the field of water, two main sectors are competing for access to deep groundwater, which is the main exploitable resource in the region. Strong competition for water resources exists between drinking water supply for households in urban agglomerations and tourism, and water for agricultural purposes. A clear priority is currently given to drinking water supply in the governorate of Medenine, where 53.5 percent of the 101 wells are in operation for non-agricultural uses (Romagny and Cudennec 2006). Deep aquifers throughout the governorate in 2002 provided 33.47 million m$^3$ of water (an increase of 46 percent compared to 1991), distributed as follows: 72.9 percent for households; 17.4 percent for agricultural purposes; 9.3 percent for hotels; and 0.4 percent for industrial use (Ministry of Agriculture 2002).
In order to meet the challenge of increasing food production with little allocated water, the mobilisation of all available water resources and the improvement of water use efficiency are inevitable. As a result, the role of water harvesting has been highly recognised in all regional agricultural development plans.

Institutions and actors involved

The local water management institutional structure in the region is quite dense, involving public, private and community-based institutions.

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Agriculture and Hydraulic Resources (DG RE)</td>
<td>Evaluating, monitoring and preserving water resources; national water planning; financing.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ministry of Agriculture and Hydraulic Resources (DG GREE)</td>
<td>Constructing and exploiting the irrigated perimeter and developing drinking water systems in scattered rural settlements.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>National Company for Water Exploitation and Distribution (SONEDE)</td>
<td>Supplying drinking water in urban areas; exploiting, maintaining and rehabilitating facilities and infrastructure for water abstraction, conveyance, treatment and distribution.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>National Sanitation Office (ONAS)</td>
<td>Implementing and operating wastewater treatment plants.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Regional Office of Agricultural Development (CRDA)</td>
<td>Managing allocation.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Municipality of Medenine</td>
<td>Local water planning; raising awareness of water issues.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Delegation of Northern Medenine</td>
<td>Local water planning; raising awareness of water issues.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Municipal Council of Medenine</td>
<td>Local water planning; raising awareness of water issues.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Agricultural Service Cooperation of Northern Medenine</td>
<td>Developing irrigation techniques; selling cereals, agricultural produce and feed concentrates.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>35 water interest groups (GIC)</td>
<td>Supplying water in rural areas.</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>NGOs</td>
<td>Participating in local water planning and environmental monitoring; raising awareness of water issues.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Institut des Régions Arides Medenine</td>
<td>Involved in research and management.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>ODA projects (e.g. WB-funded natural resources management project)</td>
<td>Funding and managing water-related projects.</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Public participation and stakeholder involvement issues

As discussed above, public participation in local governance in Tunisia is based on a decentralised structure, but is uniquely linked and dependent on the central government. Municipal councils have a very important role in the promotion of public participation at the local level, although they are created and dissolved by the state. They are charged with key functions, mainly in the area of service delivery at the municipal level. They also
levy and collect taxes at the local level. Municipal councils, which vary in size according to population, are elected for a five-year term on the basis of a majority system. Municipal councils are headed by mayors, who are selected by the members. Decision making in the municipal councils is relatively open, with opportunities for NGOs and civil society to participate. Committee hearings and council meetings are open to the public. Neighbourhood associations are especially important in this regard.

Rural councils, whose members are appointed by the governor, exist in small towns with an appropriate population size (minimum 5,000 inhabitants), but those towns can eventually obtain the status of municipalities. They are represented by their presidents on the regional council.

The civil sector in Medenine governorate can be considered very active. The municipality of Medenine, besides numerous active NGOs, has 35 active water interest groups (GICs) and one agricultural service cooperative.

**Problem analysis**

The municipality of Medenine faces the following main water security–related problems:

- scarce surface water due to low and irregular rainfall and arid climate;
- overexploitation of groundwater;
- the threat of salinisation of groundwater resources;
- competition between two main sectors (municipal and agricultural) over groundwater resources;
- low or absent intra-sectoral integration in water security–related issues, particularly in the agricultural sector, and with tourism, services and other economic sectors;
- low coverage of the sewerage network and low efficiency of water re-use; and
- a low level of awareness about water saving, water harvesting and re-use.

**Conclusions, including the relevance of the local context**

- Medenine is a typical Tunisian semi-arid/arid area that is mostly urbanised and that has (in the Tunisian context) high economic potential that is compromised by the chronic threat of water scarcity. In this respect, project interventions in this municipality can be replicated elsewhere in Tunisia.
- At the same time, Medenine municipality demonstrates some water security–related problems that are typical for Tunisia (overexploitation of resources, salinisation, governance failures etc.), as summarised below.

**Selection criteria**

<table>
<thead>
<tr>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
</tr>
<tr>
<td>Population</td>
</tr>
<tr>
<td>Specific water security–related</td>
</tr>
<tr>
<td>problems identified</td>
</tr>
<tr>
<td>Scarce surface water</td>
</tr>
<tr>
<td>Overexploitation of groundwater</td>
</tr>
<tr>
<td>Low or lacking intra-sectoral</td>
</tr>
<tr>
<td>integration in water</td>
</tr>
</tbody>
</table>
security–related issues

- Low coverage of sewerage network and low efficiency of water re-use
- Low level of awareness about water saving, harvesting and re-use

<table>
<thead>
<tr>
<th>Competition for use of natural resources</th>
<th>• Competition between two main sectors (municipal and agricultural) over groundwater resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degradation of natural resources</td>
<td>• Threat of salinisation of groundwater resources</td>
</tr>
</tbody>
</table>
| High vulnerability                       | • Groundwater, due to overexploitation
• Human and social systems, due to rapid urbanisation
• Agriculture                            |
| Strong local partners with good knowledge of pressing issues | Good institutional framework for participation and strong local actors (GICs, NGOs). |
| Established networks with stakeholders and authorities | Still to be established. |
| Recently completed and current projects | • Integrated Rural Development Programme (IRDP)
• Natural Resources Management Project
• Soil and Water Conservation Project |
Delegation of Sajnène, Tunisia

General background

Sajnène delegation is located in northern Tunisia, 120 km north-west of Tunis. Administratively attached to the governorate of Bizerte, it has 43,482 inhabitants, 4,879 of whom live in urban areas, and 38,603 in rural areas. The population density is 70.01 inhabitant/km². The delegation covers an area of 609 km², nearly 50 percent of which is occupied by dense forests. Sajnène delegation is an underdeveloped delegation, characterised by a high poverty rate (25 percent) and low development index (0.154), ranking 225th out of the total of 264 delegations in Tunisia. The number of poor families is 28 per 1,000, which is well above the national average of 22 and the average for the governorate of Bizerte (18). The unemployment rate in Sajnène is twice the national average (14 percent). The road infrastructure in the delegation is relatively good, and the ratio of classified roads (0.35) is slightly above the national average (0.33). Industrial activity is very weak. There are only five private enterprises per 1,000 inhabitants in the region, in comparison with the national average of 50 private companies per 1,000 inhabitants. There are currently only four factories in the city. An industrial zone is under construction.

Sajnène is a production centre for artisanal pottery with Berber motifs, exclusively produced by women and used mainly as ornaments and for cooking. Livestock keeping is the main activity of the population, according to the local agricultural board (10,000 head of cattle, 25,000 sheep, 9,000 goats, 5,000 horses, 1,000 rabbits, 280,000 poultry and 1,200 beehives). The land is typically used for the cultivation of cereals (durum wheat, barley, sorghum), while vegetables and arboriculture are less common.

The direction of the prevailing wind is north-west. Rain is very abundant, with an annual average of 810 mm. Most rain falls in winter, between October and February.

Overview of water management challenges

Total surface water resources in the delegation of Sajnène are estimated at 169 million m³ per year — that is, 3,895 m³/inhabitant/year, which is 10 times higher than the national average (about 400 m³/inhabitant/year). Surface water originates from four main dams (Sajnène dam, with an annual contribution of 98 million m³; Gamgoum dam with 20 million m³; El Harka dam with 20 million m³; and Eziatine dam with 30 million m³) and 20 small dams. The annual contribution of the small dams is estimated at 1.4 million m³.

Groundwater is exploited from the water table in the valley of Wadi Sejnane. There are 10 wells and 680 shallow wells. The annual exploitation of groundwater is estimated at 1.5 million m³, and the exploitation rate is estimated at 56 percent.
In addition, Sajnène has multiple natural water sources in the mountains. The table below shows the characteristics of natural water sources, established according to the interviews conducted with the rural population during the field visit, and either measured or estimated.

<table>
<thead>
<tr>
<th>Source name</th>
<th>Locality</th>
<th>Flow (l/s)</th>
<th>TDS (mg/l)</th>
<th>Annual contribution (m³/year)</th>
<th>Population that can be served</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ain El Bel</td>
<td>Esshabnia</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain El Mouta</td>
<td>Esshabnia</td>
<td>20</td>
<td>***</td>
<td>630,000</td>
<td>17,200</td>
</tr>
<tr>
<td>Ain Tamra</td>
<td>Esshabnia</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain Boufarwa</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>413</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain Ghader</td>
<td>Sidi Mechreg</td>
<td>20</td>
<td>532</td>
<td>630,000</td>
<td>17,200</td>
</tr>
<tr>
<td>Tellet El Fras</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>374</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Harhara</td>
<td>Sidi Mechreg</td>
<td>&lt;5</td>
<td>***</td>
<td>157,000</td>
<td>4,300</td>
</tr>
<tr>
<td>Ain El Karma</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain El Kwailia</td>
<td>Esshabnia</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ras El Ain</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>El Mamlia</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain Bou Atis</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain El Bachem</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
<tr>
<td>Ain El Gameh</td>
<td>Sidi Mechreg</td>
<td>0.33</td>
<td>***</td>
<td>10,400</td>
<td>700</td>
</tr>
</tbody>
</table>

Annual water resources from natural sources are estimated at 1.5 million m³. These resources of highly superior quality, such as mineral water, are poorly exploited because of difficult access. These natural resources can greatly satisfy the needs of the rural population in Sajnène (38,603 inhabitants). The population can be fed by gravity from these natural sources, with low capital costs and relatively low operating costs.

The water supply for the town of Sajnène (total 4,879 inhabitants) is operated by the national water utility SONEDE. The town is supplied from two wells, located 3 km away. The rate of connection to the network in the urban area is nearly 100 percent. However, SONEDE has no responsibilities in rural areas of the delegation. The rural population, abandoned to its fate, obtains water from the nearest point — awadi, a mountainous natural source etc. As presented in Chapter IV, the management and operation of water networks in Tunisian rural areas, both for drinking water and irrigation, are the responsibility of GDAs (Groupements de Développement Agricole), which operate as NGOs. The drinking water network was initially created by the General Directorate of Rural Engineering (under the Ministry of Agriculture), and then transferred to the GDAs. There are 18 GDAs responsible for drinking water supply in the delegation of Sajnène, seven of which are dissociated, while the rest have structural problems. As a result, the connection rate to the drinking water network is near to zero in rural zones, resulting in underdevelopment and acute poverty among a population that lives in close proximity to one of the richest water “tanks” in Tunisia. Some people living in the rural area of Sajnène delegations spend more than two hours every day carrying 40 litres of water.

**Parched Sajnène dies of thirst near the fountain**

El Maldia, a settlement of 250 households that lies 6 km from the town of Sajnène, is supplied from the river during the wet season, and from a GDA located in Bazina (about one and a half hour on foot) in summer. El Maatlia, with 120 households, is supplied from the natural source Tellet El Frass, to which access is very difficult. Sidi Mechre, with 600 households, is not connected to a drinking water network, despite the nearby natural source Ain El Ghader, which has a flow rate higher than 20 l/s.
Wastewater in Tunisia is the responsibility of ONAS. However, as ONAS is not active in Sajnène delegation, the municipality has to manage the wastewater network. The wastewater collection network in the urban agglomeration of Sajnène serves almost 1,000 inhabitants. Wastewater is discharged directly into the Sajnène River without any treatment, causing huge environmental problems.

The irrigated area in Sajnène covers 3,700 ha, although only 1,200 ha are currently irrigated. The water supply comes from the Sidi El Barrak dam, located in the neighbouring delegation of Nefza. Irrigated perimeters are managed by four GDAs. The irrigation network includes four pumping stations and several tanks. The annual water consumption of the perimeter is estimated at 6 million m³. No plan or block diagram exists among the various GDAs or the organisation that represents the Ministry of Agriculture in the region. The number of flow meters installed on the network is not known. The perimeters suffer from various physical problems, including low pressure, low hydraulic efficiency, bad management, and a lack of drainage of the plains.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupe de développement agricole (GDA)</td>
<td>- Operating and managing the irrigation network - Operating and managing the drinking water network in the rural zone</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Ministry of Agriculture/Regional Office of Agricultural Development (CRDA)</td>
<td>- Creating irrigated areas - Creating potable water network in the rural zone</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>National Water Utility (SONEDE)</td>
<td>- Supplying drinking water in urban and rural areas - Operating and managing potable water network</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Municipality</td>
<td>- Managing wastewater management</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Public participation and stakeholder involvement issues**

The participation of civil society in the field of water resources management is weak.

**Problem analysis**

The following problems were identified in Sajnène:

- difficult access to safe drinking water for the rural population, causing underdevelopment and a high poverty rate in rural areas;
- wasting of water resources from natural mountain sources;
- bad management of water for irrigation;
- the discharge of sewage into the river without treatment, causing water pollution; and
- doubtful choice of wastewater collection and treatment system in the urban area, as traditional sanitation is more appropriate in the delegation of Sajnène.
Conclusions, including the relevance of the local context

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>609 km²</td>
</tr>
<tr>
<td>Population</td>
<td>43,482</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified     | • Difficult access to safe drinking water for the rural population that causes underdevelopment and a high poverty rate in rural areas  
• Waste of water resources from natural mountain sources  
• Bad management of water for irrigation  
• Discharge of sewage into the river without treatment, causing water pollution  
• Doubtful choice of wastewater collection and treatment system in urban area, where traditional sanitation would be more appropriate |
| Competition for use of natural resources                | No significant competition.                                                                           |
| Degradation of natural resources                        | Water pollution due to lack of water treatment infrastructure in the urban area.                      |
| High vulnerability                                      | Environmental quality.                                                                                 |
| Strong local partners with good knowledge of pressing issues | None.                                                                                               |
| Established networks with stakeholders and authorities  | None.                                                                                               |
| Recently completed and current projects                 | No available data.                                                                                    |
Delegation of Mornag, Tunisia

General background

The delegation of Mornag lies to the south-east of Tunis and is administratively attached to the Ben Arous governorate. It has 58,069 inhabitants, 35,612 of whom live in the urban area and 22,457 in rural areas. The population density is 142 inhabitants per km². Mornag is mainly known for its agricultural plain, which is dedicated to arboriculture. It is also the residence of the rich Tunisian class. It is one of the richest plains in Tunisia, where the price of an acre of agricultural land can reach up to EUR 150,000. The delegation of Mornag covers an area of 397 km².

Mornag is a relatively developed delegation in an underdeveloped country. With a development index of 0.116 it ranks 72nd out of the total of 264 delegations in Tunisia. At 12 percent, the poverty rate is almost equal to the national average. The number of poor families is 17 per 1,000, which is slightly below the national average (22 per 1,000).

The unemployment rate in the delegation of Mornag is 11 percent, slightly below the national average (14 percent) and comparable with the unemployment rate in the Ben Arous governorate. The road infrastructure is good and the rate of classified roads are 0.62, which is twice the national average. Industrial activity in the region is in line with the national average (50 private companies per 1,000 inhabitants).

The area is characterised by a semi-arid climate with an extended dry season that begins in May and ends in October. The average annual rainfall is 400 mm. The prevailing winds in Mornag are from the east, north-east and south-east.

Overview of water management challenges

The total allocation of water in Mornag is 583 m³/inhabitant/year, which is 1.5 times higher than the national average. The overall surface water resources are in the range of 18.73 million m³/year, or 322.55 m³/inhabitant/year. There is one large dam (El Hma), five medium-sized dams and 27 small dams in the delegation. The annual contribution of El Hma dam is about 5.73 million m³. The estimated annual contribution of the five medium-sized dams is 6 million m³, and the estimated annual contribution of the 27 small dams is 2 million m³. Mornag is also fed with an annual 5 million m³ from Northern Tunisia through the Medjerda Cap Bon channel. This amount is used for the irrigation of a total area of 5,300 ha.

The delegation of Mornag has two groundwater tables: a Quaternary aquifer and an Oligocene sandstone aquifer. The volume of annual withdrawals is estimated at 15.13 million m³. Exploitable resources are estimated at 9.14 million m³ per year.
However, groundwater is already overexploited, with the rate reaching 175 percent. As a result, the level of the water table is falling and the salinity of the water is increasing. However, this situation has not discouraged farmers and landowners from creating new wells: indeed, the number of illegal wells and the number of non-accredited drillers is increasing daily. At the same time, the sharp increase in land prices is causing the fragmentation of agricultural land holdings and increasing the number of wells in the area, resulting in the overexploitation of the aquifer. The mismanagement of the collective irrigation network supplied by surface water has also encouraged the creation of illegal wells.

The strong demand for the creation of new wells is also due to the poor quality of the service provided by the GDA that manages the irrigation system on the plain of Mornag. Flow failures, lack of pressure, difficult access to the hydrant and other mismanagement issues are frequent.

The delegation of Mornag is supplied with drinking water from the north of Tunisia and from seven wells. The water supply network, managed by SONEDE, is well developed in the urban and rural areas of the delegation. The connection rate exceeds 90 percent in the urban area and 80 percent in rural areas. The water supply network was initially created by the General Directorate of Rural Engineering (Ministry of Agriculture) and then transferred to the GDAs. Half of the rural population is served by eight GDAs that are operational thanks to the technical support provided by SONEDE.

Total annual drinking water consumption is estimated at 2.46 million m$^3$, of which 86 percent is for household use and 14 percent for industrial use.

Wastewater in the delegation of Mornag is managed by ONAS. There is a wastewater collection network with a connection rate of 88 percent, which collects nearly 5,000 m$^3$ of wastewater each day. Wastewater is treated biologically using the activated sludge method in a treatment plant with a daily processing capacity of 2,000 m$^3$. The volume of wastewater exceeds the capacity of the WWTP twofold. Treated wastewater is discharged into Wadi Meliane, the outlet to the Mediterranean Sea in the city of Rades. The rate of water pollution at the outlet is high, particularly as a result of wastewater discharges from the entire Ben Arouss governorate, which has a high level of industrial activity.

There are two large irrigated areas in Mornag: the irrigated perimeter of Mornag, covering an area of 5,300 ha; and the irrigated perimeter of El Hma, with an area of 1,000 ha. Three other irrigated perimeters, each with an area of 150 ha, have been abandoned because of the bad management of their irrigation networks. Their irrigated area, which serves 350 farmers, is supplied by newly created and relatively operational dams of the same name. The El Hma perimeter, where 90 percent of cultivated land is dedicated to arboriculture and 10 percent to vegetables, is supplied by a pressurized network. Water consumption per hectare is estimated at 4,000 m$^3$ per year.

The old irrigated perimeter of Mornag, built with asbestos cement pipes, is supplied from Medjerda Cape channel. There are around 1,500 farmers, and annual consumption is estimated at 5 million m$^3$. The irrigation network is managed by five GDAs, all of which suffer from a lack of material, technical, financial and human resources. The hydraulic performance of the network is low: the flow at the hydrant is weak, with a lack of pressure and a very high leakage rate.
**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
</table>
| Groupe de développement agricole (GDA) | - Operating and managing the irrigation network  
- Operating and managing the drinking water network in the rural zone | Low | High |
| Ministry of Agriculture/Regional Office of Agricultural Development (CRDA) | - Creating irrigated areas  
- Creating potable water network in the rural zone | High | Low |
| National Water Utility (SONEDE) | - Supplying drinking water in urban and rural areas  
- Operating and managing the potable water network | High | High |
| National Office of Health and Sanitation (ONAS) | - Managing wastewater  
- Treating wastewater | High | High |

**Public participation and stakeholder involvement issues**

The participation of civil society in the field of water resources management is weak.

**Problem analysis**

The following problems were identified in Mornag:

- overexploitation of the groundwater table;
- pollution of the recipient water body (Mediterranean Sea) by wastewater; and
- bad management of irrigation water use.

**Conclusions, including the relevance of the local context**

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>397 km²</td>
</tr>
<tr>
<td>Population</td>
<td>58,069</td>
</tr>
<tr>
<td>Specific water security-related problems identified</td>
<td></td>
</tr>
</tbody>
</table>
- Overexploitation of the groundwater table  
- Pollution of the recipient water body (Mediterranean Sea) by wastewater  
- Bad management of irrigation water use |
| Competition for use of natural resources | Strong competition over groundwater resources (households and irrigation) |
| Degradation of natural resources | Water pollution of wastewater recipient |
| High vulnerability | Groundwater resources |
| Strong local partners with good knowledge of pressing issues | None |
| Established networks with stakeholders and authorities | None |
| Recently completed and current projects | No data |
Greater Alexandria, Egypt

General background

Alexandria is one of the most downstream cities located on the north-western border of the Nile Delta. It borders the Mediterranean to the north, Al Beheira governorate to the south, Abu Qir Bay to the east, and the town of El Hamman to the west. Administratively, Alexandria governorate comprises three cities: Alexandria, Borg El Arab, and New Borg El Arab.

The total area of Alexandria is 2,680 km² and it is divided into six districts: the Montazah, Eastern (Shark), Central Alexandria (Wassat), Western (Agamy), Customs (Al-Gomrok) and Amiriya districts. There are 30 informal settlements, with a total of 1.36 million inhabitants: nine in Montazah district, eight in Amiriya district, five in the Eastern district, two in the Central district, five in the Western district, one in Borg Al Arab. Out of the total area, surface water represents 8 percent, agricultural land 27 percent, desert 53 percent, and built urban area about 12 percent.

The population is 4.281 million, although has an attractive destination for tourists it attracts an additional 2 million people in the summer. In addition, Alexandria experiences a large influx of workers commuting daily from the adjacent Beheira and Matrouh governorates. The city has seen rapid population growth in the past century, and growth remains rapid, mainly due to rural–urban migration. It is projected that the population in 2037 will reach over 7 million. Fifty-one percent of the population is under the age of 20.

There are about 30 squatter settlements where one-third of the population (1.2 million people) lives, with limited access to infrastructure and municipal services and a high rate of unemployment (15 to 20 percent).

There is a high level of certainty that the population will continue to grow in the coming decades. According to Donia et al. (2010), the estimated number of inhabitants in Alexandria will increase by a factor of 47 percent by 2037.

Of the total area, about 1,230 km² are desert (53 percent); agricultural land and green areas cover about 730 km² (27 percent); and the urban built area covers 310 km² (12 percent). Population growth, coupled with economic development and the changing lifestyles of Alexandria’s population, has resulted in significant spatial changes in the city (e.g. the establishment of ports such as Dekhila; power stations such as Sidi Krir; and recreational villages). In the eastern part of Alexandria valuable agricultural land has fallen victim to urban development. Observations between 1984 and 1993 show a 23.79 percent loss of green land, at an annual rate of 0.67 percent (Abdou-Azaz 2008).

The climate in the Alexandria region is one of the mildest on the Mediterranean Sea. It varies from moderate in the north to semi-arid in the south. Temperatures range from 19°C in January to 30.5°C in August. Monthly mean relative humidity varies between a
minimum of 64.7 percent in April to a maximum of 71.3 percent in July, while average wind speed is 13 km/h. Average annual rainfall ranges between 170 and 190 mm in coastal areas, with a highest daily rainfall of 64.4 mm.

**Overview of water management challenges**

Alexandria faces freshwater stress due to: (1) the increasing use of freshwater for agricultural purposes upstream of Tarat-ul-Mahmoudia, allowing less freshwater to enter Alexandria; and (2) the growing internal demand for water for an increasing population. In addition, Alexandria’s share of water depends on upstream water usage: any excess use of water upstream will have an impact on Alexandria’s share of water.

The available water resources are 12 million m$^3$/day (Helali et al. 2009), mainly comprising upstream water from the Nile through channels (10.40 million m$^3$/day), drainage water re-use (1.10 million m$^3$/day) and wastewater re-use (0.50 million m$^3$/day). Groundwater potential is very limited.

The total amount of water consumed in the Alexandria governorate is currently up to a maximum of 12.9 million m$^3$/day. Of this amount, 58 percent is used for irrigation, 32 percent for municipal purposes, and 10 percent for industrial use. However, during periods of minimal water consumption (8.5 million m$^3$/day), the rate of industrial water increases to 14 percent, and the rate of water consumed for municipal purposes increases to 38 percent. Current water consumption for municipal purposes in Alexandria is 1.33 million m$^3$/day (excluding Borg El Arab, which has a consumption of 0.42 million m$^3$/day). Consumption in Borg El Arab (2.355 litres per capita per day) is significantly higher than in other urban districts of Greater Alexandria, where average water consumption is (still high) 268 litres per capita per day. Very high per capita water consumption also characterises the Amrya district (524 litres per capita per day). This is due to the existence of many factories in Borg El Arab and Amiriya, which have a high water consumption rate.

Freshwater demand is growing: it is estimated that the current overall shortage of water is about 1.6 billion m$^3$ per year. According to estimates, population growth will increase water consumption in Alexandria: it is estimated that municipal water consumption will reach 1.45 million m$^3$/day in 2037 (excluding Borg El Arab).

Water is delivered to the city through several canals: Al-Mahmoudia canal and Al-Nubaria canal drain water from the Nile River (Rosetta branch) to deliver it to eight water purification plants (El-Maamoura, El-Siouf, El-Nozha, El-Manshia, Rond Point, Forn El-Geraia, El-Noubaria and Borg El-Arab), with a total capacity of 3.5 million m$^3$/day. The plants are run by Alexandria Water Company (Holding Company for Drinking Water Supply, AWCO). The water purification plants use flocculation and sedimentation techniques, filtration and chlorination. The Alexandria Water Company meets more than 95 percent of the total water demand within the city, with the exception of some small parts of the so-called slum areas, where, according to the current planning law, citizens should submit building licences in order to be supplied with drinking water. The total length of the pipeline network is 8,600 km.

Unaccounted-for water in Alexandria is 36 percent of the water produced, which is about 318.4 million m$^3$ per year of treated water. The majority of water losses are due to leakages from pipes and old networks.
Currently, 86 percent of the population is served by wastewater facilities. The remainder, around 0.5 million people, live in rural areas and rely on on-site sanitation (septic tanks). The current policy is to expand the sewerage system to connect these areas. A total of 1.5 million m³ of wastewater are treated per day in 13 wastewater treatment plants run by Alexandria Sewerage and Drainage Company (Holding Company for Sanitary Drainage). Most plants already have secondary treatment. However, the two main plants (the East treatment plant with a capacity of 607,000 m³/day and the West treatment plant with 462,000 m³/day) still use primary treatment only and are currently in the process of upgrading. The treated water, which corresponds to the Egyptian code, is mostly discharged into drains that carry the water to Mariout Lake. Industrial wastewater has a total flow of 308,000 m³/day, of which 260,000 m³/day are discharged into the sewers having received primary treatment (being upgraded to secondary). An amount of 48,000 m³/day of industrial wastewater is discharged into Lake Mariout without treatment.

Currently there is only limited re-use of wastewater, although the potential for wastewater re-use exists. Wastewater re-use is currently limited, mainly due to poor wastewater management, non-compliance with national standards for re-use, financial constraints, and lack of legal support to encourage users to re-use wastewater. In addition, there is a general negative public perception about wastewater re-use (Hamdard 2010).

There are growing concerns about competition for water between agricultural and urban users, particularly over the water of Tarat ul Mahmoudia canal. Data from the Alexandria Water Company show that the production of water is increasing, but that agricultural water use is also increasing. The General Authority for Rehabilitation Projects and Agricultural Development is planning to reclaim about 120,540 m² under its agriculture expansion policy, which would require at least an estimated 1.6 billion m³/year (Hillaly et al. 2009). Also, farmers have traditionally been free to choose what to grow and are used to getting water free of charge. The agricultural sector accounts for about 20 percent of the country’s GDP and about 34 percent of jobs, thus is subject to positive discrimination in terms of government policies, including water policies.

Freshwater contamination due to the direct discharge of partially treated or untreated wastewater is a significant limiting factor for the availability of freshwater. The total dissolved solids value for most groundwater in Alexandria is generally higher than 1,000 ppm, making the water unsuitable for domestic uses. Furthermore, nitrate concentrations are above the highest standard for drinking water due to the excessive use of fertilisers. Prior to 1987, most of Alexandria’s sewage was discharged into the sea from 19 outfalls. This sewage, which included industrial, domestic and agriculture waste, increased the amount of pollution and heavy metals in the sediment along the beach. Lake Mariout is extensively polluted due to the discharge of untreated sewage, sewage with primary treatment and industrial waste. The lake now receives about 900,000 m³/day of primary treated effluent from the East and West WWTPs. The amount of coliform bacteria in the effluent is above safe levels. The lake also receives about 48,000 m³ of direct industrial wastewater daily. Wastewater discharge since 1988 has substantially reduced the fish population in the lake. Wastewater production in Alexandria is growing with the

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53 Alexandria is the only exception in Egypt, where wastewater companies are separate from water supply companies.
increasing urban water demand: as a rule, about 80 percent of domestic water supply is converted into wastewater. The negative effects of this wastewater on the surrounding environment, and more particularly on groundwater and surface water sources and health, has created an alarming situation in Alexandria.

Recent studies suggest seawater intrusion to about 63 km inland in the Nile Delta aquifer. This covers all the aquifers beneath Alexandria.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Description and main responsibilities</th>
<th>Power</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexandria governorate</td>
<td>Is the leading executive and administrative body of Alexandria.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>MWRI</td>
<td>Responsible for all issues concerning water resources management in Alexandria. Responsible for managing Nile water as well as surface water, groundwater and rainwater resources. Ensures that water resources satisfy the increasing requirements and demand, and keeps water bodies free of pollution.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>MHUDD</td>
<td>Responsible for all water supply and sanitation services in Alexandria.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Alexandria Water Company (Holding Company for Drinking Water Supply)</td>
<td>Branch of the National Organization for Potable Water and Sanitary Drainage, under the MHUDD. Ensures that water supply reaches all consumers within the Alexandria area.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Alexandria Sewerage and Drainage Company (Holding Company for Sanitary Drainage)</td>
<td>Branch of the National Organization for Potable Water and Sanitary Drainage, under the MHUDD. Ensures that sanitation services reach all consumers within the Alexandria area.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>MALR</td>
<td>Ensures the optimal allocation and utilisation of agricultural resources (particularly land and water) together with conserving, improving and developing these resources to achieve sustainable agricultural development.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>EWRA</td>
<td>Economic and technical regulation of utilities.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Ministry of Environment: Egyptian Environmental Affairs Agency</td>
<td>Ensures the management of natural resources and mitigation measures to address the pollution of water, air and soil.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ministry of Health and Population</td>
<td>Ensures the quality of water for end users, and minimises health risks from water-related diseases.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Alexandria Local Council</td>
<td>A locally elected body that has an advisory role in all local development issues, including water security.</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>NGOs</td>
<td>An active NGO community exists in Alexandria. Water issues are at the core of many NGOs, including, for example, the Egyptian Water Partnership (EWP); Friends of the Environment; Pioneers of the Environment.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Research community</td>
<td>Academic institutions, such as the University of Alexandria and the National Institute for Ocean Sciences.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Fishermen’s Authority</td>
<td>Contributes to the minimisation of water pollution.</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
Local communities | Local civil society organisations have a significant role in putting pressure on decision makers regarding water-related problems.
---|---
Low | High

**Public participation and stakeholder involvement issues**

There is strong cooperation between the elected public local council and the vibrant civil society represented by strong NGOs in Alexandria. This cooperation facilitates development processes and stakeholder participation.

A further enabling factor at city level is the noticeable and welcome international donors’ interest in Alexandria’s development. This has led to the establishment of a coordinating donor activities unit within the governorate, which lays the groundwork for the beginnings of a sector-wide approach in the city. An excellent example was Alexandria’s participation in the SWITCH programme (2006–2011), which was aimed at achieving sustainable and effective urban water management schemes in 30 to 50 years. During the SWITCH programme an effective stakeholder platform (Learning Alliance) was established.

**Problem analysis**

Water demand within Alexandria is increasing dramatically and water sources may not be sufficient to cover all future demand. Several problems related to the quality and quantity of water may have a great impact on the future availability of water. The main predicted water problems in Alexandria can be summarised as follows:

- increased demand due to population growth and migration;
- climate change;
- high water leakage and unaccounted-for water;
- high water consumption per capita;
- seawater intrusion;
- surface water and groundwater quality; and
- pollution of beaches and lakes.

**Conclusions, including the relevance of the local context**

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>2,680 km²</td>
</tr>
<tr>
<td>Population</td>
<td>4.281 million</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | - Increase in demand due to population growth  
- Impact of climate change  
- High water leakage and unaccounted-for water  
- High water consumption per capita  
- Seawater intrusion  
- Surface water and groundwater quality  
- Pollution of beaches and lakes  |

<p>| Competition for use of natural resources | Competition between agricultural and urban water use, particularly over the water of Tarat ul |</p>
<table>
<thead>
<tr>
<th><strong>Mahmoudia canal</strong></th>
<th>• Alexandria’s share of water depends on upstream water usage, and any excess use of water upstream will have an impact on Alexandria’s share of water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Degradation of natural resources</strong></td>
<td>• Water contamination due to open discharge of partially treated or untreated wastewater</td>
</tr>
<tr>
<td></td>
<td>• Groundwater pollution</td>
</tr>
<tr>
<td></td>
<td>• Extensive pollution of Lake Mariout</td>
</tr>
<tr>
<td></td>
<td>• Severe seawater intrusion</td>
</tr>
<tr>
<td><strong>High vulnerability</strong></td>
<td>• Surface water and groundwater, due to pollution</td>
</tr>
<tr>
<td></td>
<td>• Human systems, due to expected water shortages</td>
</tr>
<tr>
<td></td>
<td>• Human systems, agriculture and economy due to expected climate change impacts</td>
</tr>
<tr>
<td><strong>Strong local partners with good knowledge of pressing issues</strong></td>
<td>• Strong cooperation between the elected public local council and the vibrant civil society represented by strong NGOs</td>
</tr>
<tr>
<td><strong>Established networks with stakeholders and authorities</strong></td>
<td>• Learning Alliance, developed by SWITCH project</td>
</tr>
<tr>
<td><strong>Recently completed and current projects</strong></td>
<td>• In 2007 and 2008 the Institute for Sustainable Futures (ISF) conducted action research and training workshops in Cairo and Alexandria on the method of integrated resources planning as applied to urban water</td>
</tr>
<tr>
<td></td>
<td>• SWITCH project</td>
</tr>
<tr>
<td></td>
<td>• The Holding Company for Water Supply and Sanitation together with the Alexandria Water Company developed a 2037 Master Plan for Water Supply for the city</td>
</tr>
<tr>
<td></td>
<td>• The Ministry of Housing, in cooperation with Alexandria Sewerage and Drainage Company, is aiming to enhance the treatment and re-use of sanitary wastewater that is currently being discharged into water bodies</td>
</tr>
<tr>
<td></td>
<td>• Alexandria governorate is implementing the Informal Settlements Development Programme to address the ongoing expansion of slums:</td>
</tr>
<tr>
<td></td>
<td>o CEDARE/EC-funded projects</td>
</tr>
<tr>
<td></td>
<td>o ALAMIM/SMAP II project working on integrated coastal zone management in Lake Mariout area</td>
</tr>
<tr>
<td></td>
<td>o CIRCE project, working on climate change in the coastal area of Alexandria</td>
</tr>
<tr>
<td></td>
<td>o WADI project on the sustainable management of Mediterranean freshwater and transitional water bodies: a socioeconomic and environmental analysis of changes and trends to enhance and sustain stakeholder benefits in the Lake Mariout area</td>
</tr>
</tbody>
</table>
15th of May City, Egypt

General background

Established in 1978 to provide integrated urban development close to, and under the direct influence of, Cairo, 15th of May City lies south-east of Helwan, 35 km from Cairo. The city's total area of 49.5 km² is home to a population of 200,000. This new urban area has been developed over the last 20 years to solve the problem of insufficient housing in Greater Cairo.

The average family comprises 5.2 people, which is a relatively high average, putting pressure on water consumption and sanitation services. This pressure has resulted in water shortages, which are considered the city's main problem.

With virtually no rainfall during the year, 15th of May City has an arid hot desert climate (BWh according to the Köppen and Geiger classification). The average temperature is 22.1°C, and average rainfall is 17 mm. Precipitation is lowest in May, with an average of 0 mm. Most precipitation falls in December, with an average of 5 mm. The difference in precipitation between the driest and wettest months is 5 mm. During the year, the average temperature varies by 14.9°C.

The city was constructed on a complex geological formation composed of argillaceous limestone, marl and shale. As a result, some buildings developed cracks and groundwater appeared beneath some of them. Recent geological surveys showed faults and joints in some localities and clay strata in others. These structures and clay layers may be responsible for the instability of this new urban area, especially due to rising groundwater levels.

The city has become one of the largest industrial developments in Egypt, employing more than 150,000 people in heavy industries such as steel and cement works. There is a big industrial area (1.4 km²) and the city's 119 factories have an annual production of EGP 381 million. Another 103 factories are under construction, with investment capital of EGP 144 million.

The city is divided into neighbourhoods and districts. Six neighbourhoods, each with a population of about 25,000, form a district. The districts in turn form "quarters", which have administrative and commercial facilities.

Overview of water management challenges

The city is served by a water supply system exclusively from water purification plants. In the absence of local water treatment plants, 15th of May City relies on fresh treated water fed from Helwan purification plant, with a capacity of nearly 65,000 m³/day. This plant delivers water to the city through a main pipeline with a diameter of 1,000 mm, and
a new pumping plant with a capacity of 78,000 m$^3$/day at the city’s northern entrance. Households and industrial users are connected to the freshwater network by a 216 km pipeline. There is also an 88 km irrigation network for agricultural purpose.

Various factors influence water consumption rates, including the size of the city, climate, standard of living, water pressure, water metering and cost, the water collection system and the sanitary discharge system. Water usage in 15$^{th}$ of May City is categorised as domestic (50 percent of total water use), irrigation (20 percent), commercial (10 percent), services consumption and industrial consumption in the new industrial zone (15 percent). Current municipal (household) water use is 45,000 m$^3$/day (16.5 million m$^3$/year), while industry and construction consume around 8,000 m$^3$/day (2.9 million m$^3$/year). Even irrigation, which consumes around 12,000 m$^3$/day (4.4 million m$^3$/year), is served from the same water supply network. The planned expansion of the city will significantly increase water demand, which will create further stress on the already stressed water supply situation in this part of Egypt.

In fact, this amount of water will not be adequate for future consumption, which is expected to increase due to the expansion and development of 15$^{th}$ of May City at its current population growth rate. The water supplied to the city does not satisfy actual water needs, thus water shortage is considered a major problem in the city.

The city lies on a natural declining slope from north to south (from 170 m to 126 m above sea level) and from east to west. The sanitation system was designed without the need for a main pumping station inside the city. Wastewater streams are collected under the influence of gravity from their sources through a 145 km sewerage network to the city’s WWTP (which has a capacity of 46,000 m$^3$/day). The average effluent discharged from the WWTP ranges from 19,000 m$^3$/day to 25,000 m$^3$/day. The treated effluent is then discharged through a pipeline with a diameter of 450 to 700 mm, which is connected with the Helwan discharge pipeline, and both are discharged to an area of lower elevation. Local residents in these areas use the resulting effluent for crop irrigation, posing a considerable health hazard due to the Helwan effluents, which are mostly discharged untreated.

As in the case of water supply, it is evident that wastewater management will gradually become a significant problem for the city, due to the high population pressure. It is estimated that the quantity of wastewater will increase fourfold when 15$^{th}$ of May City reaches the planned population size.

Despite the decline in groundwater table levels in the majority of MENA aquifers, explorations show that the level of groundwater is rising in 15$^{th}$ of May City due to the complex geological structure. The rising groundwater table, structures characterised by the presence of caves and cracks, and clay strata may be responsible for the instability of this new urban area.
**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Description and main responsibilities</th>
<th>Power</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWRI</td>
<td>Responsible for all issues concerning water resources management in 15th of May City. Responsible for managing Nile water as well as surface water, groundwater and rainwater resources. Ensures that water resources satisfy increasing requirements and demand, and keeps watercourses free of pollution.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>MHUDD</td>
<td>Responsible for all water supply and sanitation services in 15th of May City.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Greater Cairo Water Company</td>
<td>Branch of the National Organization for Potable Water and Sanitary Drainage, under the MHUDD. Ensures that water supply reaches all consumers within the area.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Greater Cairo Sanitary Drainage Company</td>
<td>Branch of the National Organization for Potable Water and Sanitary Drainage, under the MHUDD. Ensures that sanitation services reach all consumers within the 15th of May City area.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>EWRA</td>
<td>Responsible for economic and technical regulation of utilities.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Ministry of Environment: Egyptian Environmental Affairs Agency</td>
<td>Ensures the management of natural resources and mitigation measures to address the pollution of water, air and soil.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Ensures the quality of water for end users and minimises the health risks of water-related diseases.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Municipality of 15th of May City</td>
<td>A locally elected body that has an advisory role in all local development issues, including water security.</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>NGOs</td>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Local communities</td>
<td>Local civil society organisations have a significant role in putting pressure on decision makers regarding water-related problems.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

**Public participation and stakeholder involvement issues**

There is wide public participation in 15th of May City through NGOs and charities concerned with issues such as solid waste collection from homes and streets for recycling, and water recycling and re-use. However, institutional cooperation between the civil sector and local government is lacking, and the NGOs are powerless and fragmented.

**Problem analysis**

- High water consumption rate per capita, including the use of freshwater for irrigation and industrial purposes, despite the existence of tertiary treated water discharged into Al-Saf drain.
- Rise of groundwater level, affecting structures and clay layers, which may be responsible for instability of this new urban area.

**Conclusions, including the relevance of the local context**

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>49.5 km²</td>
</tr>
<tr>
<td>Population</td>
<td>200,000</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | - High water consumption rate per capita  
- Use of freshwater for irrigation and industrial purposes  
- Rise of groundwater level, affecting the bearing capacity of the soil |
| Competition for use of natural resources | - No significant competition over water |
| Degradation of natural resources | - |
| High vulnerability | - |
| Strong local partners with good knowledge of pressing issues | - |
| Established networks with stakeholders and authorities | - |
| Recently completed and current projects | - |
Municipality of Essaouira, Morocco

General background

Essaouira lies on the Atlantic Ocean, 175 km west of Marrakesh. A medium-sized city, it is the capital of Essaouira province and has approximately 63,000 inhabitants according to the country’s census, half of whom live in the historical medina quarter, or old town of Essaouira. Population growth is estimated at 2.5 percent. The municipal area covers some 90 km².

The climate of Essaouira is Mediterranean with oceanic influence, due to its location on the Atlantic coast. It belongs to type Csb (dry-summer temperate), according to the Köppen classification, very similar to San Francisco. Unlike other coastal cities in Morocco, Essaouira enjoys a mild climate throughout the year, with an average minimum temperature between 12°C and 13°C between November and February. Rainfall varies between 300 and 400 mm/year, while sunshine reaches about 3,000 h/year. The rainy season lasts from October to April and the dry season from May to September. Rain falls, on average, on 40 to 50 days per year.

Essaouira is isolated from the main national communication networks. Urban employment is limited to sectors such as tourism and handicraft production. The previous economic basis, provided by the fishing industry, is in crisis. The current economic decline has had severe repercussions, on both quality of life and the built environment. The city’s cultural heritage has also suffered degradation. The continued expansion of the city inland is threatening its fragile ecosystem and, in turn, the very survival of the city. These developments have given rise to several contentious issues. On the one hand, the geographical and ecological setting of the city induces severe development constraints and calls for the limiting of the city’s growth. On the other hand, the general economic stagnation and population increase calls for the enhancement of urban development, which can only further jeopardise the ecosystem.

Tourism is increasingly important in Essaouira, with pleasant hotels located in traditional Moroccan riads in the old town. There are also modern hotels along the beach. Essaouira is also famous for windsurfing and kite surfing, with powerful winds that blow almost constantly in the bay.

Overview of water management challenges

Essaouira municipality is located in the Essaouira-Kourimat basin, the area of Ksob Igouzoulane (Atlantic coastal Essaouira) that is made up of the Atlantic coastal basins of Ksob and Igouzoulane, covering an area of about 5,000 km². The basin represents a
natural geographical and hydrological unit, and regional water management operates in this frame. The area extends over 24,800 km² and is home to some 2.8 million inhabitants in six administrative districts.

<table>
<thead>
<tr>
<th>Basin</th>
<th>Oued Ksob</th>
<th>Oued Igouzoulen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin area</td>
<td>1,346 km²</td>
<td>383 km²</td>
</tr>
<tr>
<td>Inputs</td>
<td>1.07 l/s/km²</td>
<td>1.41 l/s/km²</td>
</tr>
<tr>
<td>Annual module</td>
<td>1.44 m³/s</td>
<td>0.54 m³/s</td>
</tr>
</tbody>
</table>

Water management in the Tensift-Ksob-Igouzoulen hydraulic basin is the responsibility of the Tensift Hydraulic Basin Agency. The agency is mandated to plan, develop and manage water resources in the region.

Essaouira is currently supplied exclusively from groundwater resources. These water resources are mobilised by two separate systems:

- an old system that mobilises the local water table, comprising two boreholes, six wells and a source (spring) for around 170 l/s overall; and
- a recently commissioned water system that mobilises the Meskala table through three boreholes with an overall production capacity of 150 l/s.

The current drinking water needs of the city of Essaouira and its surrounding areas are estimated at 8 million m³/year and the demand for drinking water is evaluated at 14 million m³/year up to 2030.

The assessment of the quality of surface water shows that the water of the Atlantic coastal basins (Ksob and Iguezoulane) is generally of good quality. Regarding groundwater, most of the basins’ water is of medium to high quality:

- groundwater of good quality, suitable for all uses without major constraint, is found in Meskala-Akermoud plate; and
- the groundwater of Essaouira syncline is of average to poor quality.

Regarding the management of water and sanitation utilities, the municipality of Essaouira is a typical example of water service management mode in Morocco. In accordance with the communal charter, water and sanitation have been entrusted to the National Agency for Energy and Water of Morocco (ONEE) as part of a management contract.

The amount of drinking water produced in 2014 was 5.6 million m³. The total length of the drinking water network is about 140 km, with an efficiency of 63 percent, and the number of subscribers is around 26,000. One hundred percent of households are connected to piped water supply. The rate of access to water supply services in rural areas is 87 percent. Water systems are pressurised 24 hours a day (i.e. continuous water supply).

The total length of the existing sewerage network is about 116 km. Essaouira has a WWTP (a natural lagoon system) with a capacity of 9,250 m³/day. An extension of this station is under construction in order to increase capacity to 11,664 m³/day by switching to an aerated lagoons system. Treated wastewater is expected to be re-used for golf course irrigation in the tourist area.

The municipality of Essaouira, and ONEE as the water and sanitation service provider, are facing the following main water security–related problems:
• water resources in the Essaouira coastal basin are severely affected by the climate in terms of quantity and quality, including irregular rainfall and climate variability;

• groundwater is overexploited, and new opportunities for the exploitation of groundwater in the basin are limited. As part of the research efforts for the mobilisation of additional water resources, studies to improve knowledge of the aquifer of the Essaouira-Kourimat system are underway. These studies will help provide a better understanding of the hydrodynamics of the aquifer system in order to ensure a more accurate assessment and establish guidelines for rational management;

• seawater intrusion problems and high risk for groundwater;

• the performance of the WWTP (sludge accumulation); and

• the low rate of wastewater re-use.

The main challenges for the water sector in Essaouira include:

• socioeconomic development, which creates significant changes in water needs in the domestic, industrial and agricultural sectors;

• regional development focusing on the water-intensive agricultural and tourism sectors;

• the need to improve the water supply rate in rural areas through individual connection;

• sanitation problems in rural areas;

• the need to improve the efficiency of the drinking water network;

• the development and maintenance of staff capacity;

• the need to improve relationships between waterusers; and

• the optimisation of asset management.

Institutions and actors involved

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Energy, Mining, Water and Environment</td>
<td>Identifying and evaluating water resources. Planning for the development of water resources. Managing water resources.</td>
<td>High</td>
<td>High Implementing the national strategy and the national water plan.</td>
</tr>
<tr>
<td>Tensift River Basin Agency</td>
<td>Preparing the master plan for IWRM at the basin level. Ensuring the implementation of the master plan for IWRM at the basin level. Managing and monitoring the use of water resources. Completing the necessary</td>
<td>High</td>
<td>High Using water resources according to the master plan for IWRM under its jurisdiction; collecting fees for</td>
</tr>
<tr>
<td>Municipality of Essaouira</td>
<td>Infrastructure for the prevention and mitigation of flood risks. Controlling pollution at the basin level.</td>
<td>Domain; completing all water-level measurements; providing financial help and technical assistance to service providers for the prevention of water pollution and the efficient use of water resources.</td>
<td>Water abstraction and effluent discharges.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Municipality of Essaouira</strong></td>
<td>The local council decides on the creation and management of public utilities (drinking water, sanitation, electricity...).</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td><strong>Regional Office for Agricultural Development</strong></td>
<td>Storing, collecting, distributing and transferring water (for irrigation) from or to agricultural exploitation institutions.</td>
<td>Power in the management of water from or to agricultural exploitation institutions.</td>
<td>Providing the best service to agricultural exploitation institutions.</td>
</tr>
<tr>
<td><strong>ONEE</strong></td>
<td>Planning the supply of drinking water. Carrying out studies concerning drinking water. Ensuring the completion of tasks for production and distribution units. Providing drinking water distribution and sanitation services commissioned by the municipality.</td>
<td>High</td>
<td>As a delegate (service provider), complying with the contract with the delegator (the municipality).</td>
</tr>
<tr>
<td><strong>Donors</strong></td>
<td>Funding projects.</td>
<td>Institutions’ legitimacy can be measured by the amount of budget allocated to the area.</td>
<td>Sustaining livelihoods and water security. Promoting cooperation between the people and</td>
</tr>
</tbody>
</table>
Public participation and stakeholder involvement issues

At the regional level, regional water committees play a key role in the development of cooperation between the state on the one hand and local communities on the other, by contributing to the development of master plans for basin-level IWRM; encouraging municipalities’ work in the field of water demand management and the protection of water resources from pollution; and helping to raise public awareness of the need to protect and conserve water resources. With respect to drinking water and sanitation, the municipality, according to the communal charter, decides on the creation and management of public utilities, particularly for water supply and distribution and sanitation. The municipality as delegator has general authority over the delegate (service provider) in terms of economic, financial, technical, social and managerial monitoring in connection to the obligations stipulated in the contracts.

Essaouira has a proven record of public participation in local development planning. Local Agenda 21 was launched in Essaouira in 1996, including stakeholder participation in local visioning and planning processes (the Comitee de Suivi, composed of a wider group of stakeholders). Action plans are implemented through collaborative partnership between the municipality, the province, NGOs, associationsamicales (CBOs), and the private sector. One of the major achievements of the Local Agenda 21 programme was the creation of the Centre for Urban Development and Protection of the Environment (CDUPE) in the former Palais de Justice, the role of which was defined in the first Urban Pact. The CDUPE started out as a spatial project of limited size, but with a strategic impact. The well-known and centrally located building — which was dilapidated and had been closed for years — was renovated and reopened as a visible sign of the Local Agenda 21 presence. The strategic and representative location of the CDUPE on the main square of the medina makes it a central meeting space, as well as a neutral ground for discussion and negotiation between different actors, all with their own specific backgrounds and agendas.

One of the major successes of the CDUPE was the revitalisation of civil society in Essaouira. This revitalisation was primarily oriented towards the creation of so-called amicales de quartier, or local neighbourhood associations.

Efforts and local initiatives

The ONEE launched numerous local initiatives in cooperation with local actors and the municipality (water users’associations in rural areas) and developed very small local contracting companies, or micro-enterprises.

Problem analysis

The following problems were identified in Essaouira:

- climate change impacts on water quantity and quality, including irregular rainfall and climate variability;
- changed patterns in water use, including higher demand in the agricultural and tourism sectors;
• overexploitation of groundwater;
• seawater intrusion;
• operation of the WWTP (sludge accumulation);
• low rate of wastewater re-use; and
• institutional fragmentation in the water sector.

Conclusions, including the relevance of the local context

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>90 km²</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | • Climate change impact on water quantity and quality, including irregular rainfall and climate variability  
• Changed patterns in water use, including higher demand for agriculture and tourism  
• Overexploitation of groundwater  
• Seawater intrusion;  
• Operation of the WWTP (sludge accumulation)  
• Low rate of wastewater re-use  
• Institutional fragmentation of the water sector  |
| Competition for use of natural resources | • Competition between drinking water supply and water for industry and agriculture.  |
| Degradation of natural resources    | • Overexploitation of groundwater    |
| High vulnerability                  | • Seawater intrusion causing groundwater problems.  
• Sludge accumulation in lagoons at the WWTP.  |
| Strong local partners with good knowledge of pressing issues | Amicales (CBOs) and local NGOs.  |
| Established networks with stakeholders and authorities | CDUPE; network of amicales.  |
Municipality of Tata, Morocco

General background

The town of Tata in south-western Morocco has a population of 15,192 (2004 census) and covers an area of 50 km². It is the largest town in the province of Tata and the fourth largest in the region of Guelmim-Es Semara. It is located in a plain of the Sahara Desert, south-east of Agadir and Taroudannt, close to the Algerian border. The territory of the province of Tata features a combination of mountains, desert, huge palm groves, the Ksour range, and the oldest rock art sites in Morocco. The relief of the province comprises mainly the Anti-Atlas massif and vast stony plains known as regs dominated by the slopes of the wadis. The region has a physical homogeneity with an oasis landscape in places where water potential is easily exploitable, and another in the Saharan desert and rocky areas.

Given its position in a pre-Saharan region, the province of Tata is characterized by a Saharan continental climate. The temperature varies from 49°C during the summer to 12°C in winter. The average recorded rainfall rarely exceeds 100 mm/year.

Water potential in the province comprises wadis and groundwater. Floods are an important resource for subsistence agriculture and for replenishing the groundwater.

Despite the specific climatic conditions, the agricultural sector plays a key role in the local economy, since it provides work for about 80 percent of the labour force. The sector is also dominated by pastoral activity, rooted in the traditional nomadic lifestyle.

Overview of water management challenges

Drinking water in the province of Tata is provided primarily from the groundwater table, including that stored in the sub-basin of Foum Tata Adiss. The volume currently mobilized from these resources is 3.8 million m³/year. The total current production capacity in the province of Tata is estimated at 118 l/s. The current peak water need is estimated at a total of 64 l/s.

Water needs for the city in 2009 were estimated at 22 l/s, with a production capacity of 35 l/s. Currently, the demand for drinking water is about 30 l/s (0.94 million m³/year). Water demand in 2030 will reach up to 361/s, or 1.1 million m³/year, and the future peak demand for 2030 is estimated at 119 l/s, or 3.75 million m³/year.

The ONEE is the water and sanitation service provider. The production of drinking water was 682,000 m³ in 2014. The total length of the drinking water network is about 65 km, with an efficiency of 68 percent, and the number of subscribers is 3,963. In rural areas, the access rate to water supply services is 99 percent. The rate of households connected to
piped water supply is very high (95 percent). Water systems are pressurised 24 hours a day (i.e. continuous water supply).

The total length of the existing sewerage network is about 48 km. Tata has a WWTP (a natural lagoon system) with a capacity of 980 m$^3$/day.

The municipality of Tata faces the following main water security–related challenges:

- Sustainable water resources are limited. Water resources in the region, with the exception of some sporadic winter precipitation, come mainly from water infiltration after rainfall in the Anti-Atlas Mountains. This seepage recharges groundwater and supplies springs and peat lands (Khettarat).
- Socioeconomic development is significantly changing water needs. Demand for water for municipal and agricultural use is constantly growing.

Institutions and actors involved

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Energy, Mining, Water and Environment</td>
<td>• Identifying and evaluating water resources.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Planning for the development of water resources.</td>
<td></td>
<td>Implementing the national strategy and national water plan.</td>
</tr>
<tr>
<td></td>
<td>• Managing water resources.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic Basin Agency</td>
<td>• Developing and implementing basin-level IWRM master plan.</td>
<td>High</td>
<td>Use of water resources according master plan for IWRM under its jurisdiction; collect fees for water abstraction and effluent discharges.</td>
</tr>
<tr>
<td></td>
<td>• Managing and monitoring the use of water resources.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Completing the necessary infrastructure for the prevention and mitigation of flood risks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Controlling pollution at the basin level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipality of Tata</td>
<td>The local council decides on the creation and management of public utilities (drinking water, sanitation, electricity...).</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>The council has power to decide on the manner in which the public utilities are to be managed.</td>
<td></td>
<td>Ensuring quality services, provided by the utility, in accordance with the delegation contract.</td>
</tr>
</tbody>
</table>
general authority over the service provider in term of economic, financial, technical, social and managerial monitoring in connection to the obligations stipulated in the contracts.

<table>
<thead>
<tr>
<th>Regional Office for Agricultural Development</th>
<th>Storing, collecting, distributing and transferring water (for irrigation) from or to agricultural exploitation institutions.</th>
<th>Power in the management of water from or to agricultural exploitation institutions.</th>
<th>Providing the best service to agricultural exploitation institutions.</th>
</tr>
</thead>
</table>
| ONEE                                        | • Planning the drinking water supply.  
• Carrying out studies related to drinking water and ensuring the completion of tasks for production and distribution units.  
• Providing drinking water distribution and sanitation services commissioned by the municipality. | High Powers related to water planning and management; and the performance of utilities. | High As a delegate (service provider) complying with the contract with the delegator (municipality). |
| Donors                                      | Funding projects.                                                                                                  | Medium Institutions’ legitimacy can be measured by the amount of budget allocated to the area. | Medium  
• Sustaining livelihoods and water security.  
• Promoting cooperation with the people and government. |

Public participation and stakeholder involvement issues

Public participation is limited.
Efforts and local initiatives

No significant local initiatives were recorded.

Problem analysis

The following problems were identified in Tata:

- limited sustainable water resources;
- changed patterns in water use, including greater demand for municipal and agricultural water use;
- climate change impacts on water quantity and quality, including irregular rainfall and climate variability;
- low staff capacity in the water sector;
- low efficiency of the drinking water network, including high non-revenue water rate; and
- institutional fragmentation in the water sector, including a low level of public participation in water issues.

Conclusions, including the relevance of the local context

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>50 km²</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | • Limited sustainable water resources  
• Changed patterns in water use, including higher demand for municipal and agricultural water use  
• Climate change impacts on water quantity and quality, including irregular rainfall and climate variability  
• Low staff capacity in the water sector  
• Low efficiency of the drinking water network, including high non-revenue water rate  
• Institutional fragmentation of the water sector, including low level of public participation in water issues |
| Competition for use of natural resources | Competition between drinking water supply and water for agriculture.                                      |
| Degradation of natural resources       | No data.                                                                                             |
| High vulnerability                     | Groundwater resources                                                                                  |
| Strong local partners with good knowledge of pressing issues |                                                                                                      |
| Established networks with stakeholders and authorities |                                                                                                      |
Municipality of Oujda, Morocco

General background

Oujda, the capital of the Oriental region of Morocco, is located in the extreme north-east of the country, about 15 km west of the Algerian border and 55 km south of the Mediterranean Sea. The city of Oujda covers 600 km² and according to the country's 2004 census was home to 400,738 inhabitants. (The estimated population in 2011 was over 450,000.) The annual population growth rate is 2.4 percent.

Oujda has a Mediterranean climate with mild, cold and rainy winters and hot summers. Average annual temperatures vary between 15°C and 20°C, with a recorded maximum of more than 40°C and a minimum of below 0°C. Rainfall is irregular and snow can fall in winter. Rainfall ranges between 350 and 500 mm per year. Oujda's climate is characterised in August by a hot wind from the Sahara, known as the Chergui.

Due to its privileged geographical position, the economy of Oujda is characterised mainly by commercial and service activities. However, several factors — including the traditional economic dependence of the Oriental region on markets in Algeria and Southern Europe, its distance from population centres on the Atlantic coast and an inadequate transport network — have contributed to the disconnection of the region until recently from national development efforts. The 2003–2013 royal initiative — the region's 10-year economic development programme introduced by King Mohammed VI in March 2003 — has transformed the Oriental region's economic focus, placing a strong emphasis on local industry, value-added agricultural production, the application of new technologies and reduced economic reliance on Algeria (e.g. the new Oujda airport was inaugurated in 2010; the Oujda Technopole industrial park is dedicated to clean technology, renewable energy, retail and offshoring; and 77 projects were launched under the Green Morocco Plan). In addition, Oujda is undergoing a EUR 222 million project to overhaul the city centre between 2010 and 2019 (Oujda Urban Pôle). The project will redevelop an area of 30 ha in the capital in four stages.

The regional education budget has quadrupled since the launch of the royal initiative in 2003. The main regional university, Université Mohammed Premier, has 45,000 students across its three campuses. Around 30,000 of these are concentrated on the main campus in Oujda.
Overview of water management challenges

Oujda falls under the jurisdiction of the Moulouya River Basin Agency (ABH Moulouya). The agency’s activities extend over four regions and nine provinces (Oujda, Berkane, Taourirt, Jerada, Nador, Taza, Boulemane, Figuig and Khénifra). The area is home to 3,371,000 inhabitants according to the latest census (2004), or 11.2 percent of the population of Morocco, at a low population density of about 46.2 inhabitants/km². The four urban areas of Oujda, Greater Nador, Greater Berkane and Khénifra represent two-thirds of this population.

The drinking water supply of the city of Oujda comes from the Jebel Hamra groundwater aquifer (part of the transboundary Bounaim-Tafna basin that covers 2,650 km², of which approximately 70 percent is located in Morocco and the rest in Algeria), and from Mechraa Hommadi dam on the Moulouya River some 100 km from Oujda (since 2007). The recharging of the aquifer is estimated at 9.5 million m³/year, realised by the direct infiltration of rainfall through an impluvium of 15 km² and by downward seepage from a pool of 300 km².

Currently, total mobilised water is 1,530 l/s (48.25 million m³), of which 830 l/s are groundwater and 700 l/s are from surface water. The use of water from Jabel Hamra already exceeds its rate of recharge (a remarkable decrease in the piezometric level of 3 m per year has been recorded).

The Jebel Hamra aquifer was initially used exclusively to supply drinking water to the city of Oujda. Initially, the operation was limited to the catchment of the Sidi Yahia source, with a capacity of 300 l/s. In the 1960s, extraction began to increase with the addition of a battery of wells, reaching over 750 l/s in 1982. Operations were subsequently reduced to around 600 l/s through a dozen boreholes. Since 2004, a further 11 boreholes have been drilled on the Algerian side to meet the drinking water needs of the Algerian population in the Bounaim basin. The boreholes are operated with a capacity of between 10 and 60 l/s. There are seven reservoirs in the Zouia area (Algeria) with radii between 5 and 35 m and a depth of 3 m. Unfortunately, precise data about the mobilised volumes are not currently available, and even the number of reservoirs and their dimensions are undefined: they have been determined from a satellite image (seven reservoirs with an estimated capacity of between 150 and 1,200 m³) (Zarhloule et al. 2010). However, overexploitation and the impacts of climate change have caused a decrease in the groundwater level of 2 to 3 m per year since 1982. After the commissioning of wells in Algeria, a decrease of 6 to 7 m/year was recorded between late 2004 and late 2006 (7 m/year in 2005) (Bensouala and Adjim 2006).

The quality of the water in Jebel Hamra aquifer is deteriorating. Salinity varies between 0.5 and 1.2 g/l. Three chemical facies are found: bicarbonate, chloride and sulphate. The high levels of sodium, chloride and sulphate are probably the result of localised leaching (space or depth) of gypsiferous deposits, and, more frequently, of anthropogenic impacts.

The average water needs of the city of Oujda in 2030 are estimated to reach 1,000 l/s at peak mode.

Water and sanitation are supplied by RADDEEO, an autonomous municipal agency owned by the municipality (and also responsible for electricity supply), and by the ONEE. The RADDEEO is a financially independent public institution with a commercial and industrial character. The agency is subject to the supervision of the Ministry of the Interior and the
Ministry of Finance and is additionally monitored by state control regarding public companies and other bodies. The total amount of water delivered in 2014 was 884 l/s (27.87 million m³), of which 661 l/s were from groundwater and 223 l/s from surface water. Some 15 million m³ were delivered by the RADEEO and 13 million m³ were delivered by the ONEE. The rate of households connected to piped water supply is very high (99 percent in both urban and rural areas). The total length of the drinking water network is about 1,660 km, and the number of subscribers is about 141,000. Water systems are pressurised 24 hours a day (i.e. continuous water supply).

The rate of households connected to the sewerage network is also very high (99 percent). The total length of the existing sewerage network is about 1,100 km. Oujda has a natural lagoon WWTP with a capacity of 40,000 m³/day. An extension to this station is under construction in order to increase capacity to 50,000 m³/day.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
</table>
| Ministry of Energy, Mining, Water and Environment | • Identifying and evaluating water resources.  
• Planning for the development of water resources.  
• Managing water resources. | High | High |
| ABH Moulouya | • Preparing the master plan for IWRM for resources at basin level.  
• Ensuring the implementation of the master plan for IWRM at basin level.  
• Managing and monitoring the use of water resources.  
• Completing the necessary infrastructure for the prevention and mitigation of flood risks.  
• Controlling pollution at basin level. | High | High |
| Municipality of Oujda | The local council decides on the creation and management of public utilities (drinking water, sanitation, electricity...). The council decides on the manner in which the public utilities are to be managed. | Medium | High |
| Regional Office for Agricultural Development | Storing, collecting, distributing and transferring water (for irrigation) from or to agricultural exploitation institutions. | Medium | Medium |
| Municipal Autonomous Agency for the Distribution of Water and Electricity (RADEEO) | Providing drinking water distribution and sanitation services. | Medium | High |
| Scientific community | | Low | High |
| Donors | | High | Medium |
| Local CBOs | | Low | High |

**Public participation and stakeholder involvement issues**

At regular meetings organised by ABH Moulouya, local actors and beneficiaries discuss and collaborate on water issues. In addition, different projects have provided training and
long-term tools for local experts and managers, raised awareness among local communities by involving local NGOs active in this area, and helped establish a suitable monitoring structure (e.g. the IUCN/ABHM project on biodiversity conservation).

**Problem analysis**

The municipality of Oujda faces the following main water security–related problems:

- overexploitation of groundwater resources (Bounaim-Tafna basin);
- transboudary water disputes over the Bounaim-Tafna basin;
- deterioration of water quality in the Jabel Hamra aquifer due to the impact of anthropogenic activity on groundwater resources; and
- leakages and water losses in the drinking water network.

**Conclusions, including the relevance of the local context**

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>600 km</td>
</tr>
</tbody>
</table>
| Specific water security–related problems identified | • Overexploitation of groundwater resources (Bounaim-Tafna basin)  
• Transboudary water disputes over the Bounaim-Tafna basin  
• Deterioration of water quality in Jabel Hamra aquifer  
• Leakage and water losses in the drinking water network |

| Competition for use of natural resources | Competition over freshwater. Since 2004, Algeria has increased groundwater drilling to meet drinking water needs in the Bounaim basin. |
| Degradation of natural resources        | Pollution of groundwater in the Jabel Hamra aquifer. |
| High vulnerability                      | Climate change impacts |
| Strong local partners with good knowledge of pressing issues | Strong scientific basis (Université Mohammed Premier and other higher education institutes). |
| Established networks with stakeholders and authorities | No formal networks, but extensive consultation exists at the level of ABH Moulouya. |
Municipality of Chefchaouen, Morocco

General background

Founded in 1471, the town (or urban municipality) of Chefchaouen (or Chaouen) is located in north-western Morocco and is the capital of the province of Chefchaouen. The province is mainly mountainous: it is located in the Rif Mountains and is bounded on the north by the Mediterranean for a length of 120 km and on the south by the provinces of Taounate and Sidi Kacem, just inland from Tangier and Tetouan. Chefchaouen is built on the top of a mountain, 600m above sea level. It is a very rugged area and has a vertical drop of about 300 m. The town has approximately 36,000 inhabitants (2004 census) living in an area of 4,350 km² with an average density of 101 inhabitants/km². The annual population growth rate is 1.20 percent. According to the population census of 2004, the illiteracy rate among children above 10 years of age was 26 percent; 15.4 percent among men; and a very high 36.8 percent among women. The city has 11 primary schools, three colleges and three high schools.

The province of Chefchaouen has several rivers that are seasonal and flow into the Mediterranean Sea. Other rivers in the province feed into other rivers rather than flowing into the Mediterranean Sea.

Three different climate types characterise the province of Chefchaouen:

- a typical Mediterranean climate in the mountainous area, rainy and cold in winter and mild in summer. Rainfall is significant and varies between 800 and 1,400 mm, sometimes reaching 2,000 mm. Snowfall is rare, but may occur;
- a semi-arid climate, which dominates the coastal zone with precipitation between 350 and 400 mm; and
- a humid climate in winter and dry in summer in the southern zone, with rainfall oscillating between 900 and 1,300 mm.

Summers can be very hot, with temperatures reaching or exceeding 40°C, and in winter it is very cold: at times minus 14°C (as in 2005).

Because of occasional heavy rainfall, combined with the morphological characteristics of the land, erosion and landslides are a huge problem in the area. Soil loss is estimated at an annual average of 3,500 tonnes/km², which is the highest rate nationwide.

The local economy is oriented mainly towards tourism, crafts and regional products. Craft products represent the majority of the city’s trade and are popular among tourists. Due to the lack of basic communications infrastructure (airport, port, rail) the city has no industrial activities, with the exception of one textile factory. Commercial activity within
the city remains modest. Economic activities are carried out mainly in the weekly *souk*, some business units and over 350 street vendors’ stalls. The town plans to create a wholesale market for vegetables and fruits.

Agricultural and livestock activities take place in a limited area recently annexed to the urban perimeter (183 ha, of which 74 ha are irrigated and 109 ha non-irrigated). Given the rugged terrain, agriculture in the province is mainly arboreal (olive and fig trees) and pastoral (goat breeding, cheese production), and products from the region are quite famous.

The town of Chefchaouen is distinguished by green spaces of incomparable environmental value, giving it quite a remarkable ecological character. It boasts many attractions and environmental attributes that give it an exemplary ecological status, such as the absence of air pollution. However, its green spaces are gradually suffering from water and solid waste pollution.

*Overview of water management challenges*

In general, groundwater resources in the area show no signs of overexploitation to date. However, they are still very limited and must therefore be used in a rational manner as a back-up resource during periods of drought.

The drinking water supply for Chefchaouen is currently provided by water catchment from sources in Ras El Ma (a village in the Rif region in north-eastern Morocco, 12 km from the Algerian border) and Tissemlal. The annual average rate of the Ras El Ma source is 410 l/s (13 million m$^3$/year). The lowest flows occur during the summer, with a historic low recorded during drought years (78 l/s). The annual average rate of the Tissemlal source is 35 l/s (1.1 million m$^3$/year). The water from Ras El Ma has good physical and chemical characteristics in accordance with Moroccan standards, although the water from Tissemlal contains limestone, thus the turbidity of the water exceeds the maximum recommended standards. Water is pumped into storage facilities. The total storage capacity of the six reservoirs of Chefchaouen is 4,620 m$^3$.

Current drinking water demand in Chefchaouen is 2.6 million m$^3$/year, with peak demand of 1,000 l/s (3.1 million m$^3$/year), and will grow to an estimated 3.4 million m$^3$/year by 2030. Under normal conditions, the volume from the Ras El Ma source (currently 3.4 million m$^3$/year) is sufficient to satisfy the water needs of the city without any deficit. However, the problem arises during droughts, which are frequent in this part of Morocco. The mobilisation of additional water resources to meet the increasing water needs of the city was strengthened by the construction of the Moulay Bouchta dam, which will ensure an additional volume of nearly 4.5 million m$^3$/year.

The National Agency for Energy and the Water of Morocco (ONEE) is the water and sanitation service provider. The volume of drinking water produced was 3.4 million m$^3$ in 2014. The total length of the drinking water network is about 56 km, with a technical efficiency of 56 percent, and the number of subscribers is 12,413. Average drinking water consumption per person is 80 litres per day. Water quality meets national standards. The management of the sector is entrusted to ONEP under a management agreement.

The network status is generally good, although water losses are considerable (at a level of 0.5 million m$^3$/year). The operator (ONEE) is currently making efforts to improve the
efficiency rate of the whole of the drinking water network in the municipality of Chefchaouen from the current value to 80 percent.

The rate of households connected to piped water supply is very high in urban areas (99 percent) and modest in rural areas (64 percent). Water systems are pressurised 24 hours a day (i.e. continuous water supply).

The total length of the existing sewerage network is around 52 km. Chefchaouen has a WWTP in the final phase of construction, with a capacity of 5.475 m$^3$/day, based on activated sludge technology. It was due to start operating in June 2015. However, some blackspots exist in terms of sanitation in Chefchaouen, resulting in the direct discharge of sewage into the Wadi El Fouarat channel.

The abundance of rainfall, the mountainous nature of the region, as well as the impermeability (for natural and anthropogenic reasons) of most watercourses, make surface runoff important in the Rif watershed. During major storms rivers flood dramatically and violently, causing severe damage and even loss of life, especially in highly urbanised areas. The hazard is not new in this region, but because of population pressure, economic development and tourism, the amount of construction and concretesurfaces has increased on the floodplains, raising the risks of flooding.

**Institutions and actors involved**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Main tasks</th>
<th>Power</th>
<th>Interests</th>
</tr>
</thead>
</table>
| Ministry of Energy, Mining, Water and Environment | • Identifying and evaluating water resources.  
• Planning for the development of water resources.  
• Managing water resources. | High  | High      |
| ABH Loukkos                        | • Preparing the master plan for IWRM at basin level.  
• Ensuring the implementation of the master plan for IWRM at basin level.  
• Managing and monitoring the use of water resources.  
• Completing the necessary infrastructure for the prevention and mitigation of flood risks.  
• Controlling pollution at the basin level. | High  | High      |
| Municipality of Chefchaouen       | The local council decides on the creation and management of public utilities (drinking water, sanitation, electricity...). The council decides on the manner in which the public utilities are to be managed. | Medium | High      |
| ONEE                              | Providing drinking water distribution and sanitation services. | Medium | High      |
| Donors                            |                                                                             | High  | Medium    |
| Local CBOs and NGOs               |                                                                             | Low   | High      |

**Public participation and stakeholder involvement issues**

There are roughly 334 associations with 1,500 members in Chefchaouen, including 60 active in areas related to development, environment, culture, sport etc. Despite general
misinformation, and an inadequate or even lacking culture of reporting or accountability to citizens, Chefchaouen municipality has made efforts to incorporate the fundamental principles of good local governance and is committed to the implementation of various information channels and the dissemination of information to the public. The municipality has introduced a number of tools to improve citizen’s participation (starting from a well-established website to public hearings). These efforts resulted in wide and institutionalised public participation during the drafting of the Municipal Development Plan in 2010. Also, major projects in the city have always been designed according to a collaborative approach and the participation of civil society, including rehabilitation projects in Med V Square and the medina.

**Efforts and local initiatives**

Chefchaouen City Council ratified a statement proclaiming Chefchaouen as an “ecological city” in 2010. More importantly, the city has been declared a Cultural Heritage Site by UNESCO. The city council is therefore committed to undertaking a number of measures related to environmental protection, such as the adoption of a policy on the management of natural resources and an environmental policy. This policy has been translated through the enhancement of biological diversity in the territory, the creation and development of green spaces in the city, the organisation of environmental awareness campaigns, and the involvement of civil society and residents in workshops focusing on designing and evaluating sustainable development projects in the city.

**Problem analysis**

The following main problems were identified in Chefchaouen:

- socioeconomic development, which creates major changes in water needs, mainly for municipal water supply;
- climate changes coupled with adverse geological and geomorphological conditions, which affects the precariousness of hydrological regimes and thus influences the mobilisation and development of water resources;
- the area is prone to torrential flooding, erosion and landslides;
- climate change may increase the risks of natural disasters, especially droughts and torrential floods, that may lead to water shortages and pollution;
- the low technical efficiency of the water supply network;
- the low rate of connection to piped water supply in rural areas;
- changing patterns of water use, including higher demand for municipal and agricultural water use; and
- low staff capacity in the water sector.

**Conclusions, including the relevance of the local context**

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Specific context of the municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>4,350 km²</td>
</tr>
</tbody>
</table>
Specific water security related problems identified

- Socioeconomic development creates major changes in water needs, mainly for municipal water supply
- Climate change, coupled with adverse geological and geomorphological conditions, affects the precariousness of hydrological regimes, influencing the mobilisation and development of water resources
- The area is prone to torrential flooding, erosion and landslides
- Climate change may increase the risk of natural disasters, especially droughts and torrential floods, which may lead to water shortages and pollution
- Low technical efficiency of the water supply network
- Low rate of connection to piped water in rural areas
- Changing patterns of water use, including higher demand for municipal and agricultural water use
- Low staff capacity in the water sector

| Competition for use of natural resources | None. |
| Degradation of natural resources         | Erosion and landslides. |
| High vulnerability                       | Climate change; flooding; droughts. |
| Strong local partners with good knowledge of pressing issues | Strong civil society, including NGO sector and CBOs. |
| Established networks with stakeholders and authorities | None, but with potential for easy establishment. |
Annex 2. Climate change impacts on water resources — National assessment

Algeria

Due to its geographical location and climate characteristics, Algeria is highly vulnerable to climate change and is expected to be negatively affected by impacts ranging from the increased frequency and intensity of floods and droughts, worsening water scarcity, intensified erosion and sedimentation, a rise in sea level, and damage to water quality and ecosystems. Climate change impacts on water resources will also result in impacts on human health and on many parts of the economy and society, as various sectors, such as agriculture, health and tourism, depend directly on water — as does the environment. Even a small rise in temperature would lead to various socioeconomic problems that would hinder the development of the country. Models predict less frequent but more intense rainfall events, while droughts will become more common and will last for longer. The spatial and temporal distribution of rainfall will also change. An analysis of climate data from 1931 to 1990 in northern Algeria reveals a rise in temperature of 0.5°C, which may reach an increase of 1°C by 2020. A temperature rise of 2°C is expected by 2050. A recent study carried out by the Algerian Government estimates that a 1°C rise in mean annual temperature would lead to a reduction in precipitation of 15 percent and decrease of surface waters by 30 percent. Water demand would subsequently exceed available water resources by 800 million m³.

The decrease in water resources, declining agricultural yields, encroaching desert, the challenge of planning, and energy consumption for air conditioning are only the initial impacts to which Algeria must find answers that are economically and socially acceptable. Although the contribution of Algeria to global warming is minimal (less than 0.5 percent of global GHG emissions), the country is nevertheless very vulnerable and should integrate adaptation into its development policy (Sahnoune et al. 2013).

Egypt

Egypt faces serious risks from climate change. The IPCC has concluded that Egypt will probably get hotter and drier, and that precipitation is likely to decrease in the Mediterranean region, which includes Egypt. Observed climate trends include an increase in mean maximum air temperature by 0.34°C per decade and an increase in mean minimum air temperature by 0.34°C per decade between 1961 and 2000. In part, the country is vulnerable to sea level rise, which threatens the fertile Nile River Delta (the Nile Delta). Relative sea levels are rising as a result of at least two factors. The first is that global (eustatic) sea levels are rising. The second is that the Nile Delta is subsiding. This is partly the result of the dams constructed along the Nile, which limit natural sediment flow to the Nile Delta and, in turn, cause different observed rates of sea level rise along Egypt’s coast (UNDP 2010a).

54 In contrast, the IPCC asserted that East Africa, which contains the sources of the Nile, is likely to get wetter. Roughly two-thirds of the general circulation models (GCMs) project an increase in precipitation in East Africa.
Perhaps more significant for Egypt are the potential changes in water supplies. The vast majority of Egypt’s water supply comes from the Nile and 97 percent of the country’s population lives along the river or in the Nile Delta. Most climate models project decreased flow in the Nile Basin, although under some climate models flow is estimated to increase. Egypt’s water supplies are already very limited, and population growth alone will make those supplies even more limited. A reduction in the flow of the Nile would put additional stress on water resources throughout Egypt. A reduction in the average flow of the Nile could seriously threaten Egypt’s water supplies and the well-being of its citizens. In addition to a change in water resources, sea level rise could threaten valuable lands in the Nile Delta with inundation. Higher temperatures could reduce yields of some key crops, while a decrease in water supplies could threaten the availability of irrigation. In addition, climate change could worsen Egypt’s severe air pollution.

Egypt could face reduced crop yields resulting from higher temperatures and the loss of some agricultural lands in the Nile Delta (yields of major crops are estimated to decrease by 1 to 17 percent by 2030), as well as either loss of property or higher coastal protection costs, higher mortality from air pollution, and a loss in tourism revenues. Less water due to climate change would have the most serious consequences for agriculture, which is currently responsible for the consumption of over 80 percent of all water consumed. Any reduction in water supplies, unless supplies are increased to offset the loss, will limit irrigation water. Malnutrition and unemployment would increase and total economic losses by 2060 could be several hundred billion Egyptian pounds per year. In addition, other ecosystems besides coral reefs could be harmed, water quality could deteriorate, and there could be other risks to human health besides reduced air quality.

Jordan

Climate change projections for Jordan indicate that runoff is likely to be substantially reduced in the coming decades. The available metrological data show a decrease of 22 percent in total annual rainfall during the past 60 years. All three climate change scenarios used in Jordan’s Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) estimate that the average temperature in the country will rise by approximately 1.0 to 1.3°C by 2050. According to the A1B scenario (medium emissions) changes in runoff of 10 to 20 percent for the middle of the century (2040–2060) and 30 to 50 percent for the period 2071–2100 are projected, based on simulations with global climate models (Christensen et al. 2007). Projected increases in temperature (maximum projected warming of around 5°C by the late 21st century) and reductions in rainfall suggest reductions in the availability of surface water of the order of tens of percent by the middle of the 21st century, with larger reductions in the latter half of the century. Warming is likely to be associated with an increase in evapotranspiration of nearly 30 percent (Abu-Taleb 2000). It is therefore inferred that climate change has the potential to result in the loss of over half — and perhaps even most — of the region’s current surface water resources (although this represents a worst-case scenario and there is likely to be considerable geographic and seasonal variation in climate change impacts on rainfall, surface runoff and groundwater recharge).

Climate change is predicted to bring about significant changes in the spatial and temporal distribution of rain, and the average level of precipitation is expected to decrease. As Jordan’s surface water and groundwater resources are highly dependent on rainfall, this is
projected to result in less groundwater recharge and therefore fewer available water resources. Furthermore, the decrease in water resources is expected to cause a deterioration in surface water and groundwater quality.

**Lebanon**

According to the Lebanon’s Second National Communication to the UNFCCC (2011), by 2040 temperatures in Lebanon will increase by around 1°C on the coast to 2°C on the mainland, and by 2090 they will be 3.5°C to 5°C higher. Rainfall is also projected to decrease by between 10 and 20 percent by 2040, and by between 25 and 45 percent by 2090, compared to the present. This combination of significantly less wet and substantially warmer conditions will result in an extended hot and dry climate. Temperature and precipitation extremes will also intensify. Drought periods, over the whole country, will become 9 days longer by 2040 and 18 days longer by 2090.

Changes in temperature and rainfall will positively affect agriculture, which will benefit from a longer pasture season in the mountains due to the reduced thickness and residence time of snow cover. However, the effect of climate change on water resources is expected to be significant as a result of the decrease in precipitation and projected changes in its spatial and temporal distribution, in addition to an increase in evapotranspiration. Droughts are predicted to occur 15 days to a month earlier, which will negatively affect the existing water shortage due to urbanisation and population growth. The already dry regions such as Bekaa, Hermel and the south, will be mostly affected. A reduction of 6 to 8 percent of the total volume of water resources is expected with an increase of 1°C, and of 12 to 16 percent with an increase of 2°C. The change in rainfall regimes will increase the manifestation of extreme events: winter floods may increase up to 30 percent, and hot summer days and tropical nights can last at least two months longer.

**Libya**

Libya is expected to experience a significant increase in temperature by 2100. Temperatures are expected to rise at a greater rate in North Africa than anywhere else in Africa, with summer temperature increases exceeding 4°C by the end of the century (Christensen et al. 2007). Within the country, south-west Libya is expected to be the site of greatest temperature increase. Significant decreases in precipitation are projected, particularly in the country’s northern half: a 30 percent decrease in annual mean precipitation is expected in the summer for the African Mediterranean coast by the end of the century (ibid.). Libya’s coast can expect a rise in sea level of up to 0.9 m by 2100.

**Morocco**

Despite its atmospheric, oceanic and geographic specificities, Morocco has not been spared from climate change impacts, as testified by severe and frequent drought in the last decades. The water input decrease reached 20 percent over the 1940–2005 period and the average temperature increased by more than 1°C between 1960 and 2000. Scientific investigations carried out on climate projections in Morocco have shown that climate change is likely to result in (i) an increase in summer temperatures of up to 1.8°C by 2020, 3.7°C by 2030 and 6.2°C by 2080; and (ii) a reduction in rainfall in the region of 5 to 15 percent by 2030 and 10 to 25 percent by 2050. The 3°C increase in temperature and
15 percent reduction in rainfall by 2030 would substantially reduce annual runoff and, consequently, the volume of water used by existing and planned dams. An analysis of droughts observed over the last 30 years shows that the deficit in runoff is around double that recorded for precipitation. Surface water and groundwater volume would continue to decrease, particularly in the central and southern regions, which are almost under water stress. This would result in decreasing water input for irrigated perimeters and the reconsideration of the current programme of new perimeters. Progressive aridification and recurrent drought will aggravate the continued decrease in water supply. Both issues already place the country amongst those threatened by hydraulic pressure. Increasing agricultural, urban, tourism and industrial needs, combined with climate change impacts, would result in a water gap estimated at approximately 5 billion m³ by 2030 (Kingdom of Morocco 2010).

Table 47. Summary of water balance in Morocco in 2030 and 2050 with and without the impact of climate change

<table>
<thead>
<tr>
<th></th>
<th>Climate change not taken into account</th>
<th>Climate change taken into account</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2030</td>
<td>2050</td>
</tr>
<tr>
<td>Water demand (million m³/yr)</td>
<td>13,044</td>
<td>13,269</td>
</tr>
<tr>
<td>Water resources (million m³/yr)</td>
<td>12,212</td>
<td>12,694</td>
</tr>
<tr>
<td>Overall deficit (million m³/yr)</td>
<td>-832</td>
<td>-575</td>
</tr>
<tr>
<td>Number of basins with water deficit, taking into account the use of non-conventional resources (out of 9)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Number of basins with water deficit not taking into account non-conventional resources (out of 9)</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: (El Badraoui and Berdai 2011)

**Syria**

Natural conditions in Syria are expected to alter considerably as a result of climate change. An increase of 1 to 2°C in temperature and a 10 to 18 percent decrease in the amount of precipitation is expected in the future (2020s and 2040s). The most severe effects of climate change in Syria are expected in the Al-Badiabasin, as it is highly vulnerable marginal land. This region consists of semi-deserts, and even slight changes in climate may have a strong impact on agricultural activity and livestock management. The region has already seen severe droughts in recent years (2007–2009), which are apparently linked to climate change.

Climate change will have a severe effect on Syrian water resources. It is likely to decrease surface water and groundwater by about 1,300 million m³ in 2050, and increase the evaporation from water bodies by about 190 million m³ in 2050.

**Tunisia**
The Tunisian climate is marked by variations in rainfall as well as droughts and floods. Over the past few decades, climate change has become evident in an unprecedented series of extreme weather events, such as heat waves and floods. Tunisia will be affected by climate change at the national and local levels and will suffer from impacts experienced in other countries, particularly in terms of water scarcity and food security. According to climate models, by 2050 the main consequences of climate change in Tunisia are expected to be: (i) a temperature rise of between 1.6°C and 2.7°C accompanied by the more frequent occurrence of heat waves; (ii) a drop in average rainfall levels by around 10 percent in the north-west of the country and by 30 percent in the far south; and (iii) a 15 to 18 cm rise in sea level. The predicted accelerated rise in sea level will vary between 38 and 55 cm by 2100 and will be accompanied by stronger and more frequent storms.

Expected climate change impacts in Tunisia by 2030 may include:

- a 28 percent reduction in groundwater resources and a major reduction in surface water;
- the loss of 50 percent of ground-cover vegetation in the south of the country;
- a pronounced increase in the vulnerability of ecosystems and in the risk of forest fires;
- a 20 percent reduction in land under cultivation for cereal production and the loss of about 800,000 ha of land used for arboriculture, primarily in the centre and south of the country;
- increased risks of respiratory, water-borne and vector-borne diseases; and
- threatened tourist infrastructure due to rising sea levels.

Sea level rise, which is being felt along the low-lying coasts of Tunisia, and which is likely to increase due to climate change, is a serious concern, in that it could damage the coastal aquifer formations and other underground water reserves by the intrusion of seawater, thus diminishing the quality of underground water and exacerbating existing water stress. Due to sea level rise, an acceleration of erosion/progradation, the extended temporary or permanent submersion of low coastal areas, and an increase in saltwater intrusion in underground water in coastal areas are to be expected, causing significant damage to human and development activities.

Overall water resources are in danger of decreasing significantly. Given the degradation of water quality (salinity, sedimentation, pollution) it is likely that up to 20 percent of surface water resources will be lost due to increased evaporation and the forecasted decrease in useable precipitation. Similarly, groundwater resources from aquifers, in particular underground coastal water resources, will show increasing levels of salinization, resulting from rising sea levels.

Extreme phenomena (droughts, floods, strong winds) will increase in both frequency and intensity, with very dry years likely to occur more often in the future. These changes will have serious consequences for water resources, ecosystems, agriculture and urban dwellers, thus for the entire economy and society. At the local level, an increase in temperatures, and in some cases a reduction in precipitation, are projected to reduce agricultural yields. Wheat yields, for example, may decrease by about 60 percent by 2050 in some parts of the Arab world. In general, the Tunisian economy will be increasingly
affected. The long-term local and global implications of climate change will lead to a significant reduction in total household incomes by 2030 of up to USD 1.8 billion, or 6.7 percent of GDP (Verner 2013). Evidence suggests that poor people in Tunisia are suffering more from climate change impacts and that rural households have been the hardest hit by these adverse effects, although urban households are also negatively affected by climate change.
Annex 3. Water scarcity–related indicators

Basic Human Needs (Water and Sanitation) Index

Definition

The Basic Human Needs (Water and Sanitation) Index is a composite indicator calculated as part of the Social Progress Indicator. It covers the following indices:

- Access to piped water (the percentage of the population with a water service pipe connected with in-house plumbing to one or more taps, or a piped water connection to a tap placed in the yard or plot outside the house).

- Rural vs. urban access to an improved water source (the absolute value of the difference between rural and urban access to improved drinking water, which is defined as the percentage of the population with piped water supplied to the dwelling, piped water to a yard/plot, public tap or standpipe, tube well or borehole, protected dug well, protected spring, or rainwater).

- Access to improved sanitation facilities (the percentage of the population with improved sanitation, including flush toilets, piped sewerage system, septic tank, flush/pour flush to pit latrine, ventilated improved pit [VIP] latrines, pit latrine with slab, and composting toilets).

Range

0 – 100

More info

http://www.socialprogressimperative.org

Total renewable water resources per capita

Definition

This indicator provides an estimate of the maximum theoretical amount of water resources in a country per inhabitant, calculated on the basis of: (a) sources of water within the country itself; (b) water flowing into the country; and (c) water flowing out of the country (treaty commitments). Availability, defined as the volume of surface water and groundwater resources renewed each year in each country, is how much water is theoretically available for use on a sustainable basis. Total renewable water resources are calculated as the sum of external water resources entering the country, surface water runoff volumes generated in the country, and groundwater recharge taking place in the country.

Range

N/A

More info
Water Stress Index

Definition

The Water Stress Index (WSI) measures water availability per person, calculated as an average according to both temporal and spatial scale, thus omitting water shortages in dry seasons or in certain regions with special characteristics. It is calculated as the number of people who share 1 million m³ of annually available renewable water (i.e. the unit is hundreds of persons per flow unit of 1 million m³ of renewable water).

Originally, the indicator was based on the estimation that a flow unit of 1 million m³ of water can support 2,000 people in a society with a high level of development. Annual water availability of more than 1,700 m³ per capita is defined as the threshold above which water shortage occurs only irregularly or locally. Below this threshold, water scarcity occurs at different levels of severity. The index does not take water quality into account at all, nor does it give information about a country’s ability to use resources. Even if a country has sufficient water according to the WSI, it may be the case those water resources cannot be used because of pollution or insufficient access.

Range

N/A

More info


Water Resources Vulnerability Index (Criticality Ratio)

Definition

The Water Resources Vulnerability Index (WRVI), often called the criticality ratio (CR), is defined as the percentage of total annual withdrawals out of the available freshwater resources. Water use in this indicator includes “all water withdrawals for human use”, thus it includes only water withdrawals from surface water or groundwater over a year. This is due to the unknown quality of return flow and the unknown location of water users within a watershed or country (Alcamo et al. 1997). On the other hand, water availability is defined by Alcamo et al. (1997) and Raskin et al. (1997) as the amount of surface runoff and groundwater recharge. The total precipitation evaporated or transpired by plants is not included in the WRVI.

Range

WRVI < 10% Low water stress

10% < WRVI < 20% Medium-low water stress
20% < WRVI < 40% Medium-high water stress
40% < WRVI < 80% High water stress
80% < WRVI < 100% Very high water stress

More info


J. Alcamo et al. (1997). Global change and global scenarios of water use and availability: An application of WaterGap 1.0. Center for Environmental Systems Research (CESR), University of Kassel, Germany.


Water Criticality Index

Definition

The Water Criticality Index combines two factors — the criticality ratio and water availability per capita — into a single indicator of water vulnerability in a watershed and country. The reasoning is that vulnerability increases as two conditions become more critical: (i) total water resources are used up (the critical ratio becomes larger); and (ii) the pressure on existing resources increases (water availability per capita declines). The index ranges from 1 for water surplus to 4 for water scarcity.

Range

1 Water surplus
2 Marginally vulnerable
3 Water stress
4 Water scarcity

More info

**Water Scarcity Index**

*Definition*

The Water Scarcity Index (WScI) is a general screening indicator or characterisation factor for water consumption used in lifecycle impact assessment as a means to measure the potential environmental damage of water use in three areas: human health; ecosystem quality; and resources. The indicators for water scarcity rely on the ratio of water withdrawal to hydrological availability, along with a variation factor to account for the variability of precipitation. The damage assessments are performed according to the framework of the Eco-Indicator-99 assessment methodology (Goedkoop and Spriensma 2001).

*Range* 0.1 – 0.9

0.1<WScI <0.4 No water stress

0.4<WScI <0.5 Moderate water stress

WScI>0.5 Severe water stress

*More info*


**Water Exploitation Index**

*Definition*

The Water Exploitation Index (WEI) is the total annual freshwater abstraction of a country divided by its long-term annual freshwater availability. It illustrates the extent to which total water use puts pressure on water resources. Although it does not allow for the identification of the drivers of the problem or of the main users, it has the advantage of using for its calculation consistent information that is collected periodically by the statistical services (and reported to Eurostat and AQUASTAT).

**Social Water Stress Index**

*Definition*

The Social Water Stress Index (SWSI) represents a society’s social adaptive capacity in facing the challenges of physical water scarcity. Ohlsson (2000) integrated the “adaptive capacity” of a society to consider how economic, technological or other means affect the overall freshwater availability status of a region. Ohlsson argued that the capability of a society to adapt to difficult scenarios is a function of the distribution of wealth, educational opportunities and political participation. The Human Development Index (HDI) functions as a weighted measure of the Falkenmark indicator in order to account for ability to adapt to water stress. To calculate the SWSI it is necessary to divide the Water
Stress Index (WSI) by the HDI for each country. A higher value suggests a greater degree of social water stress.

**Range**

- SWSI < 5  Relative sufficiency
- 5 < SWSI < 10  Water stress
- 10 < SWSI < 20  Water scarcity
- SWSI > 20  Beyond the barrier

**More info**


## Water Poverty Index

**Definition**

The Water Poverty Index (WPI) determines water security at household and community level based on income and wealth by using the aggregate function of five dimensions:

- **Resources** The physical availability of surface water and groundwater, taking account of the variability and quality of the resource as well as the total amount of water.

- **Access** The extent of access to water for human use, accounting not only for the distance to a safe source, but for the time needed for domestic water collection, and other significant factors. Access does not simply mean access to safe water for drinking and cooking, but also access to water for irrigating crops or for industrial use.

- **Capacity** The effectiveness of people’s ability to manage water. Capacity means the necessary income to purchase improved water, education and health.

- **Use** The ways in which water is used for different purposes; it includes domestic, agricultural and industrial use.

- **Environment** The evaluation of an integrated environment related to water within an ecosystem.

The idea of the WPI is to combine the measurement of water availability and access with the measurement of people’s capacity to access water. A lack of adequate and reliable water supplies leads to low levels of output and health. Even where water supply is adequate and reliable, people’s income may be too low to pay the costs of clean water and may drive them to use inadequate and unreliable sources of water supply. The underlying conceptual framework of the index therefore needs to encompass water availability, access to water, capacity for sustaining access, the use of water and the environmental factors that have
an impact on water quality and the ecology that water sustains. Using multi-criteria analysis, the WPI consists of five major components (resources, access, capacity, use and environment), each with several sub-components. In this structure, the Resources component can include surface water and groundwater, as well as some measure of variability and water quality. The Access component may include access to water for domestic use, and access to water for irrigation. The Use component relates the use of water to the value of the output it generates. The Capacity component focuses on individual and institutional capacity to manage water, and this is based on level of education, health status and GDP. While, ideally, issues such as value of investment in the water sector or number of water professionals would be highly relevant, such data are rarely available, thus the HDI components serve as a proxy. As a compromise, the Environment component is represented by sub-components such as biodiversity, soil erosion, or other forms of environmental degradation.

**Range**

Resulting scores range from 0 (extreme water poverty) to 100 (no water poverty).

**More info**


**Baseline Water Stress**

**Definition**

Baseline Water Stress (BWS) measures total annual water withdrawals (municipal, industrial and agricultural) expressed as a percentage of the total annual available blue water. Higher values indicate greater competition among users.

**Range**

<table>
<thead>
<tr>
<th>Score</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 1</td>
<td>Low (&lt;10%)</td>
</tr>
<tr>
<td>1 – 2</td>
<td>Low to medium (10–20%)</td>
</tr>
<tr>
<td>2 – 3</td>
<td>Medium to high (20–40%)</td>
</tr>
<tr>
<td>3 – 4</td>
<td>High (40–80%)</td>
</tr>
</tbody>
</table>
4 – 5 Extremely high (>80%)

More info

Water Dependency Ratio

Definition
The dependency ratio expresses the share of the total renewable water resources originating outside the country as a percentage. This ratio does not consider the possible allocation of water to downstream countries.

Range
Between 0 percent (the country receives no water from neighbouring countries) and 100 percent (country receives all its water from outside).

More info
FAO AQUASTAT Database (www.fao.org)

Water footprint per capita

Definition
The per capita water footprint measures the water needed for the production of goods and services consumed by the population, and it is calculated by multiplying all consumed goods and services by their respective virtual water content. The indicator parameters include both direct water use by consumers and producers, as well as indirect water use. The water footprint of a product is defined as “the volume of freshwater used to produce the product, measured over the full supply chain”.

The water footprint is a measure of human appropriation of freshwater resources. Freshwater appropriation is measured in terms of water volumes consumed (evaporated or incorporated into a product) or polluted per unit of time. A water footprint has three components: green, blue and grey. The blue water footprint refers to the consumption of blue water resources (surface water and groundwater). The green water footprint is the volume of green water (rainwater) consumed, which is particularly relevant in crop production. The grey water footprint is an indicator of the degree of freshwater pollution and is defined as the volume of freshwater that is required to assimilate the load of pollutants based on existing ambient water quality standards.

Range
N/A
More info


www.waterfootprint.org
## Annex 4. Estimates of the use of water sources and sanitation facilities

<table>
<thead>
<tr>
<th>Country</th>
<th>Urban (%)</th>
<th>Rural (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking water coverage estimates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piped into premises</td>
<td>87</td>
<td>80</td>
<td>48</td>
</tr>
<tr>
<td>Other improved source</td>
<td>13</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Other unimproved</td>
<td>0</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Surface water</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sanitation coverage estimates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved+ shared</td>
<td>99</td>
<td>98</td>
<td>77</td>
</tr>
<tr>
<td>Shared facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other unimproved</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Open defecation</td>
<td>0</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Egypt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking water coverage estimates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piped into premises</td>
<td>90</td>
<td>100</td>
<td>39</td>
</tr>
<tr>
<td>Other improved source</td>
<td>6</td>
<td>0</td>
<td>51</td>
</tr>
<tr>
<td>Other unimproved</td>
<td>4</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Surface water</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Sanitation coverage estimates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved facilities</td>
<td>91</td>
<td>98</td>
<td>57</td>
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<tr>
<td>Shared facilities</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Other unimproved</td>
<td>5</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Open defecation</td>
<td>1</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
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Annex 5. Terms of Reference (excerpt)

Terms of Reference

Local Water Security Assessment for Improved Water Management in Selected Countries of the Middle East and North Africa (MENA) Region

Background

The overall objective of the project “Sustainable Use of Transboundary Water Resources and Water Security Management” (WATER SUM) is to promote and enhance sustainable water resources management and to promote a comprehensive and integrated approach to water security and ecosystem services for sustainable development in beneficiary countries in the MENA region in order to help halt the downward spiral of poverty, biodiversity loss and environmental degradation.

The project is divided into two components: Component 1, “Water Resources Management Good Practices and Knowledge Transfer” (Water POrT); and Component 2, “Water and Security” (WaSe). The goal of the WaSe component is to promote a comprehensive and integrated approach to water security and ecosystem services for sustainable development in 12 municipalities and their local communities in Morocco, Tunisia and Algeria as part of efforts to combat water scarcity, reduce the threat of conflicts and increase overall human well-being within the wider context of ensuring regional peace and stability. The expected results include:

- the introduction and drafting of local water security action plans (LWSAPs) initiated and supported in 80 percent of target municipalities;
- partner communities working jointly towards sustainable development; and
- local environmental governance in partner countries benefiting from the LWSAP concept.

The main expected impact of the project is an institutional and behavioural change in water governance and utilisation patterns. It is expected that this will be achieved through the successful transfer of knowledge and skills to all participating actors in the water management arena for efficient river basin management in the MENA region. Additional impacts are related to improving water security as an important aspect of environmental security. Environmental security involves and reflects the ability of an entity, whether a nation or a community, to withstand environmental asset scarcity, environmental risks or adverse changes, and environment-related tensions and conflicts. In particular, this component focuses on building partnerships for water security, as an effective means of delivering development and conservation targets to local communities.

The local governance level is where water security action plans can be developed in a way that mirrors national, regional and international policy priorities that seek to reconcile the need to address water issues and promote healthy ecosystems with the need to ensure the well-being of local populations. Achieving the delivery of these policy objectives in the field of poverty reduction, sustainable development and the conservation of biodiversity is impossible without the active participation of local communities and local governments,
helped by their strategic partners (e.g. national authorities, civil society organisations and businesses).

Project objectives will be achieved by improving local governance through initiating and supporting the process of developing LWSAPs in pilot areas in selected municipalities. This will ensure the application of an integrated approach to water management as a means to enhance water security, while showcasing the direct and tangible results of supporting water-related dialogue and capacity building. Issues such as water security, sustainable socioeconomic development, biodiversity conservation, ecosystem services and the active involvement of a wide range of stakeholders will be addressed.

The process will be supported by regional bodies established by the project, national administrators, local leaders, selected experts and expert organisations (including ICLEI–Local Governments for Sustainability). The REC and its partners are well placed in the MENA region to coordinate the implementation of such actions due to their wide expertise and the networks they have created by their work in the region to date. The REC has a proven track record in assisting the establishment of viable and functional networks and coordinating their work at both local and national levels.

The planning of activities as outlined below is limited to a general overview of the tasks to be undertaken in order to achieve individual project results. The final list of activities, along with the corresponding schedule and budget for the duration of the project, will be drafted and approved by the Government of Sweden in the project’s inception phase. This will be done according to the provisions of relevant national policies and regulations, and also taking into account regional perspectives and the relevance of water management in the beneficiary countries. An important source of information (and therefore of the verification of project results) will be an assessment of the situation and needs in partner countries in the proposed area of operation.

The beneficiary countries relevant for this assessment are Morocco, Algeria, Tunisia, Libya and Egypt in North Africa; and Lebanon, Jordan and Syria in the Middle East.

Objective of the assessment

The assignment is to carry out an assessment of local water security for improved water management in selected countries in the MENA region. The assessment will be vital in order to plan the project’s implementation phase, and the results of the exercise will form a solid basis for future project activities.

The assessment findings should contribute to the following:

- An understanding of the interactions between local government institutions and civil society in achieving local sustainable development, as well as conditions enabling improved communication networks and capacity building.

- A proposed methodological approach for building internal capacities to work jointly with other stakeholders in the community (particularly local governments) towards sustainable development.

- The development of recommendations for further programme implementation concerning the optimal methodology and localisation of future interventions.
Required elements

Lot 1: Precisely define the scope and scale of the assessment and coordinate its execution

The assessment will be based on the principles of adaptive management and good governance in order to incorporate the principles of community governance processes, assess participation, and provide operational details at a scale commensurate with local water management capacity. The assessment is to be localised and comparable with the relevant national standards concerning water quality as it relates to specific uses, with a regional approach more suited to evaluating spatial changes in water quality due to dominant anthropogenic influences.

The assessment should explore the potential for using the following indicators, and the methodologies developed around them, since indicators can play an important role in the dissemination of information, transforming complex scientific data into simplified and quantified concepts that can be more readily understood and communicated to the general public; inform decision makers; report on trends; and fulfil international commitments:

- Basic Human Needs Index
- Canadian Water Sustainability Index
- Index of Water Scarcity
- Index of Watershed Indicators
- Relative Water Stress Index
- Vulnerability of Water Systems
- Water Availability Index
- Water Poverty Index
- Water Resources Vulnerability Index
- Water Stress Indicator
- Water Security Status Indicators

Proposed structure of the final assessment

- Executive summary
- Introduction
  - Context of the study
  - Water security framework
- Dimension of water security
- Threats to water security
  - Water security, climate change and water-related climate vulnerability in the MENA region
  - Summary
- Country contexts and perspectives in beneficiary countries and the region as a whole
  - Regional data
  - Individual country overviews
    - Total population
    - Ethnic composition
    - Constitutional setup
    - Administrative setup
• Ministries responsible for water management, security, local communities and local development
• Total number of municipalities
• List of national associations of local authorities
  - Political, economic and social context
  - Strategic and institutional framework
  - Summary
• Local self-government in beneficiary countries
  - Political context
  - Territorial organisation and administrative structure — local responsibilities and power/level of decentralisation and position of local self-government
  - Common characteristics
  - Summary
• Resources and water issues in beneficiary countries
  - Current situation of the water resources and water use
  - Water demand and deficit
  - Water governance and government
    • Strategic and regulatory framework
    • Institutional set-up
  - Assessment of issues (drivers, pressures, state, impact and response assessment of water resources)
  - Transboundary watershed management
  - Summary
• Local water security methodological issues/recommendations
  - Current status in the MENA region
  - Building blocks for effective water security planning at local level
  - Recommended methodology for LWS
  - Stakeholder mapping and identification of relevant ongoing initiatives in beneficiary countries
• Conclusions and recommendations
  - Conclusions
  - Recommendations
  - Proposal for a methodology for selection criteria of local communities in beneficiary countries
• Annexes and references

Lot 2: Identify stakeholders and perform stakeholder mapping

Stakeholder mapping and the identification of relevant ongoing initiatives (SMIR analysis) should be carried out based on the information obtained from available written sources, interviews with relevant institutions and selected communities in partner countries. In the SMIR analysis, the main stakeholders in the project should be identified. Stakeholders include any projects that are under way in the area of water management and/or community development; government institutions (both national and local); educational and other civil society organisations; and community-based groups. The distribution of stakeholders should be illustrated graphically in such a way that the stakeholder map has two axes: the x axis should represent the spectrum of attitudes towards the idea of the
In the SMIR analysis, two groups of stakeholders can be identified:

- Reference groups include organisations and people that the project must refer to so as to arrive at feasible solutions. They ensure that implementation will be successful.
- Users are a broad group of people who benefit from the project.

Steps required to carry out the SMIR analysis:

- Assessment of the existing situation in the field based on the above outline.
- Preparation of a consultancy report on the existing situation from an objective and professional position in the field of expertise, as described below.
- Presentation of the consultancy report to the management team, and finalisation of the document after the incorporation of proposed changes.
- Provision of technical support to the management team, as needed.

Lot 3: Assess the quality and availability of the information required to consider water security status

This includes information on:

- key water issues (the parameters of which need to be measured);
- data availability and accessibility;
- earlier (water-related) studies; and
- existing indicators.

Lot 4: Assess water security status, based on the above data, in no fewer than eight selected communities in no fewer than five beneficiary countries

The assessment must be based on the following main issues:

- Drinking water supply.
- Environmental water.
- Water quality:
  - human health; and
  - aquatic ecosystem health.
- Water quantity:
  - human health; and
  - aquatic ecosystem health.

Lot 5: Assess governance mechanisms to move towards local water security

The assessment of local sustainable development and water management strategic planning processes and practices, as main governance tools instrumental in improving water security, should address the current situation in terms of local sustainable development processes and practices in beneficiary countries and provide a critical assessment of:
• national and local-level sustainable development frameworks and activities;
• potential for community visioning and goals concerning water security objectives and targets;
• local environmental institutions, capacities, responsibilities and communication;
• factors and conditions that enable the development of organisational capacities for addressing sustainable development requirements at the local government level;
• the impact of participatory measures on the level of involvement of different stakeholders in decision-making processes;
• the current situation in relation to available local development strategies;
• the main relevant ongoing processes in beneficiary countries;
• negative and positive aspects of currently available/present local strategic documents in beneficiary countries; and
• threats to the community, restrictive factors and urgent problems with respect to the use of existing local strategic documents.

Lot 6: Assess existing models and/or develop a novel approach for assessing the water security status of selected local communities in the MENA region

The assessment should cover at least three existing relevant methodologies concerning governance for improved local water security and suggest the best-fitting methodology and/or amend it for further use within this project, based on the following aspects of beneficiary countries/communities:

• geography
• the water management/security-related issues mentioned above;
• biodiversity;
• socioeconomics;
• the vulnerability index (parameterisation and weighting);
• a diagnosis of issues (drivers, pressures, state, impact and response assessment of water resources);
• country overviews focusing on vulnerability assessment, resource stresses, development pressures, environmental insecurities, management challenges and vulnerability index; and
• critical issues relevant to local sustainability.

The final methodology should be based on the following aspects:

• cooperation with end users, whose participation enables the design of a user-friendly assessment method;
• small-scale watersheds or sub-watersheds;
the multivariate character of water management/security issues to integrate variables pertaining to water quality and water quantity as they relate to aquatic ecosystems and human health; and

concrete outputs ready for incorporation into water-related decision-making processes.
The results of indicator-based benchmarking suggest that the implementation of WATER SUM Component 2: “Water and Security” is most feasible in Jordan, Tunisia and Morocco (respectively). The establishment of a permanent structure for regional cooperation on local water security is highly recommended, as a seed for future collaboration across boundaries.