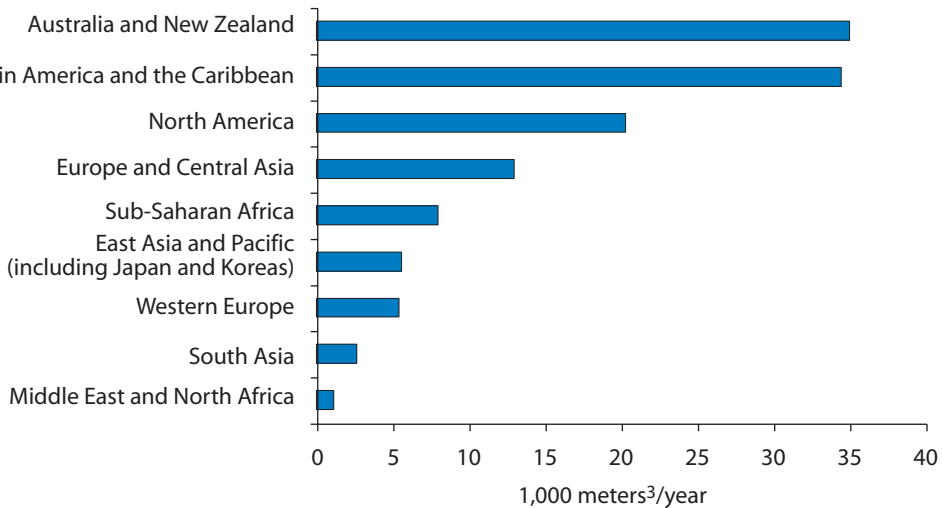


Water Resources Data

FIGURE A1.1

Actual Renewable Water Resources per Capita, by Region



Source: Table A1.1.

Note: Actual Renewable Water Resources (ARWR) is the sum of internal and external renewable water resources, taking into consideration the quantity of flow reserved to upstream and downstream countries through formal or informal agreements or treaties, and reduction of flow due to upstream withdrawal; and external surface water inflow, actual or submitted to agreements. ARWR corresponds to the maximum theoretical amount of water actually available for a country at a given moment. The figure may vary with time. The computation refers to a given period and not to an annual average. ARWR does not include supplemental waters (desalinated, or treated and reused). See table A1.1.

TABLE A1.1

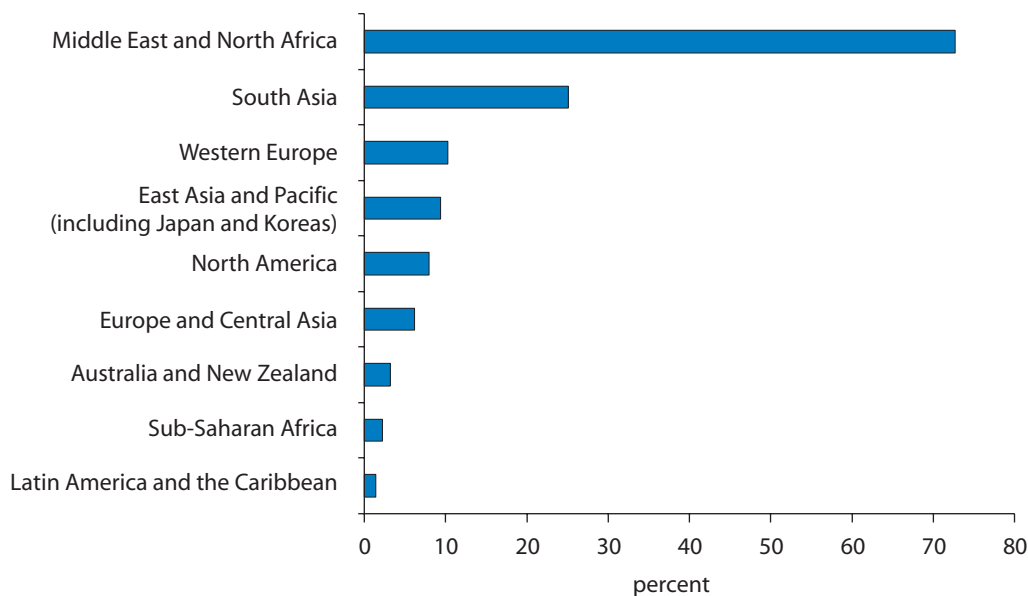
Actual Renewable Water Resources per Capita, by Region

Region	ARWR per capita (1,000 m ³ / year)
Australia and New Zealand	35.0
Latin America and the Caribbean	34.5
North America	20.3
Europe and Central Asia	13.0
Sub-Saharan Africa	8.0
East Asia and Pacific (including Japan and Korea)	5.6
Western Europe	5.4
South Asia	2.7
Middle East and North Africa	1.1

Source: FAO AQUASTAT data for 1998–2002.

FIGURE A1.2

Percentage of Total Renewable Water Resources Withdrawn, by Region



Source: Table A1.2.

Note: Figure A1.2 displays the sum of withdrawals across all countries in a region divided by the sum of all renewable water available in each country. See last column of table A1.2.

TABLE A1.2

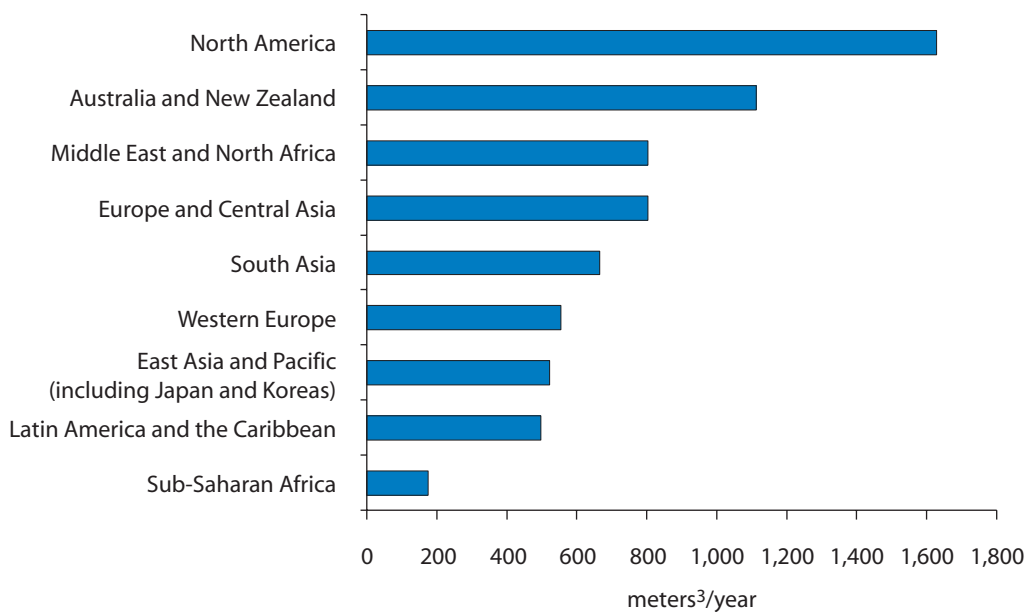
Renewable Water Resources Withdrawn, by Region

Region	Median of national percentages of total renewable water resources withdrawn	Average of national percentages of total renewable water resources withdrawn	Regional percentage of total renewable water resources withdrawn
Middle East and North Africa	114.8	337.8	72.7
South Asia	15.9	22.9	25.1
Western Europe	4.8	9.6	10.3
East Asia and Pacific (including Japan and Korea)	3.0	8.0	9.4
North America	1.6	5.8	8.0
Europe and Central Asia	10.9	24.2	6.2
Australia and New Zealand	2.8	2.8	3.2
Sub-Saharan Africa	1.7	6.0	2.2
Latin America and the Caribbean	1.1	7.4	1.4

Source: FAO AQUASTAT data for 1998–2002.

Note: Aggregated regional estimates for withdrawal of renewable water resources can be greatly impacted by the uneven distribution of water resources among countries. This is particularly the case in MENA, where the overall percentage of total renewable water resources withdrawn in the region as a whole (third column) hides the degree of scarcity of renewable water in many countries. Both the average and median of national percentages (first and second columns) indicate that MENA countries tend to extract significantly more water than is routinely replenished from natural resources. These figures highlight that the situation is more severe in MENA than in the other regions.

FIGURE A1.3

Total Renewable Water Resources Withdrawn per Capita, by Region

Source: Table A1.3.

TABLE A1.3

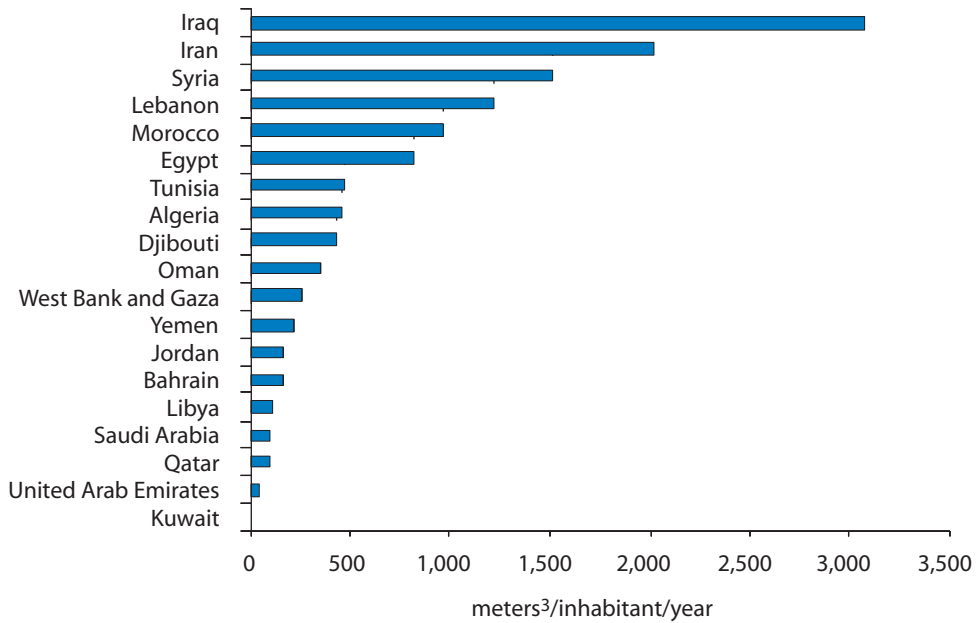
Total Renewable Water Resources Withdrawn per Capita, by Region

Region	Per capita withdrawals (m ³ /year)
North America	1,629
Australia and New Zealand	1,113
Middle East and North Africa	804
Europe and Central Asia	803
South Asia	666
Western Europe	555
East Asia and Pacific (including Japan and Korea)	522
Latin America and Caribbean	497
Sub-Saharan Africa	175

Source: FAO AQUASTAT data for 1998–2002.

FIGURE A1.4

Total Renewable Water Resources per Capita, by Country (actual)



Source: Table A1.4.

Note: Total renewable per capita combines the total internal renewable (IRWR) and external renewable water resources (ERWR) for each country. It is a measure of an average amount of water (in cubic meters) available per person annually.

TABLE A1.4

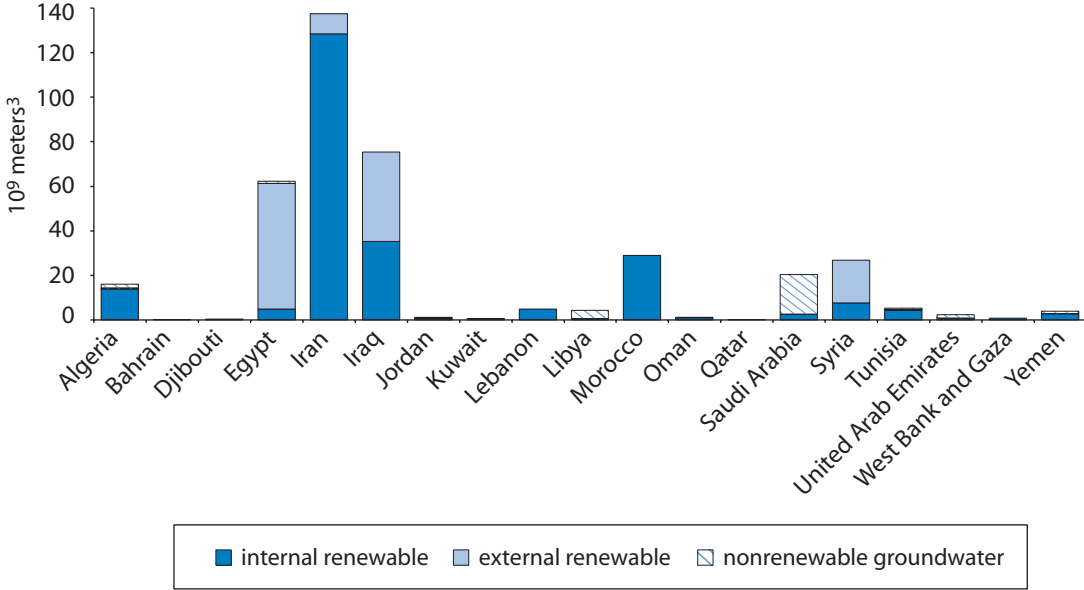
Total Renewable Water Resources per Capita, by Country

Country	Total renewable per capita in MENA (meters ³ /inhabitant/year)
Algeria	458
Bahrain	164
Djibouti	433
Egypt	827
Iran	2,020
Iraq	3,077
Jordan	165
Kuwait	8
Lebanon	1,226
Libya	110
Morocco	964
Oman	356
Qatar	88
Saudi Arabia	102
Syria	1,511
Tunisia	472
United Arab Emirates	51
West Bank and Gaza	268
Yemen	212

Source: FAO AQUASTAT 1998–2002.

FIGURE A1.5A

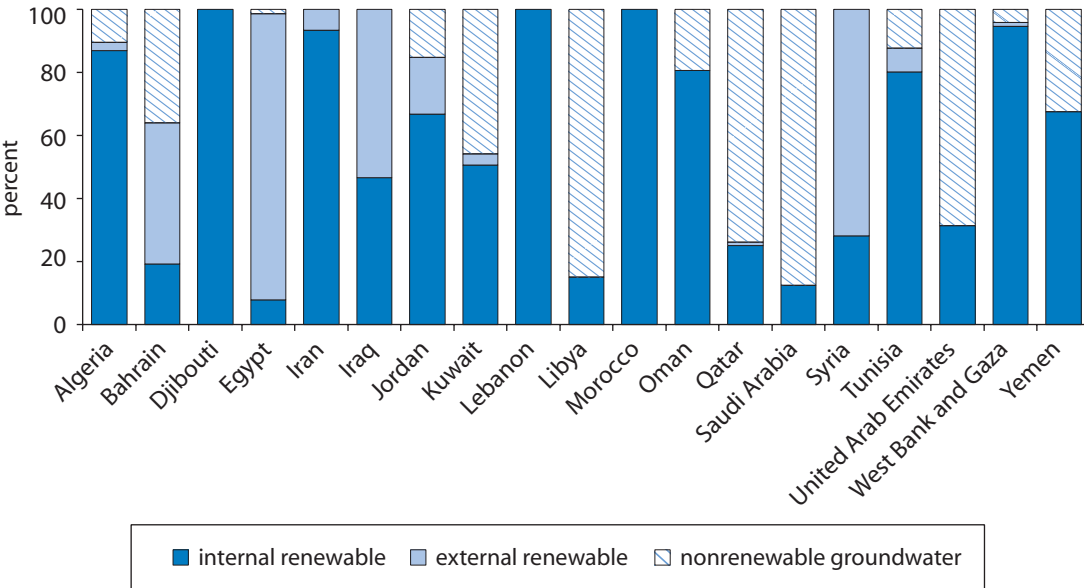
Volume of Water Resources Available, by Source



Source: Table A1.5.

FIGURE A1.5B

Percentage of Water Resources Available, by Source



Source: Table A1.5.

Note: For Bahrain, Kuwait, Qatar, and West Bank and Gaza, services are shown that are not represented in table A1.5 due to rounding to first decimal.

TABLE A1.5

Water Available or Used by Source

Country	Water available by source (10 ⁹ m ³ /yr)			
	Internal renewable water resources	External renewable water resources	Nonrenewable groundwater	Virtual water
Algeria	13.9	0.4	1.7	10.9
Bahrain	0.1	0.1	0.1	0.5
Djibouti	0.3	0.0	0.0	0.1
Egypt	4.9	56.5	0.8	18.9
Iran	128.5	9.0	0.0	6.8
Iraq	35.2	40.2	0.0	1.4
Jordan	0.7	0.2	0.2	5.0
Kuwait	0.3	0.0	0.3	1.4
Lebanon	4.8	0.0	0.0	2.0
Libya	0.7	0.0	3.7	1.4
Morocco	29.0	0.0	0.0	5.8
Oman	1.0	0.0	0.2	1.4
Qatar	0.2	0.0	0.2	0.3
Saudi Arabia	3.2	0.0	17.8	13.1
Syria	7.6	19.3	0.0	-4.1 ^a
Tunisia	4.2	0.4	0.7	4.1
United Arab Emirates	0.7	0.0	1.6	4.2
West Bank and Gaza	0.8	0.0	0.0	2.2
Yemen	2.7	0.0	1.3	1.6

Source: See note.

Note: a. Syria is a net exporter of virtual water.

Internal renewable resources: Average annual flow of rivers and recharge of groundwater generated from endogenous precipitation. A critical review of the data is made to ensure that double counting of surface water and groundwater (is avoided. Renewable resources are a measure of flow rather than stock or actual withdrawal. They are, therefore, typically greater than the volume of exploitable water resources, for which consistent data are unavailable. Data include supplemental water in IRWR, which includes desalination data; it makes a difference mostly for Egypt, for which IRWR would be only 1.8 10⁹m³/yr.

Source: FAO AQUASTAT.

External renewable water resources: External renewable water resources refer to surface and renewable groundwater that come from other countries plus part of shared lakes and border rivers as applicable, net of the consumption of the country in question.

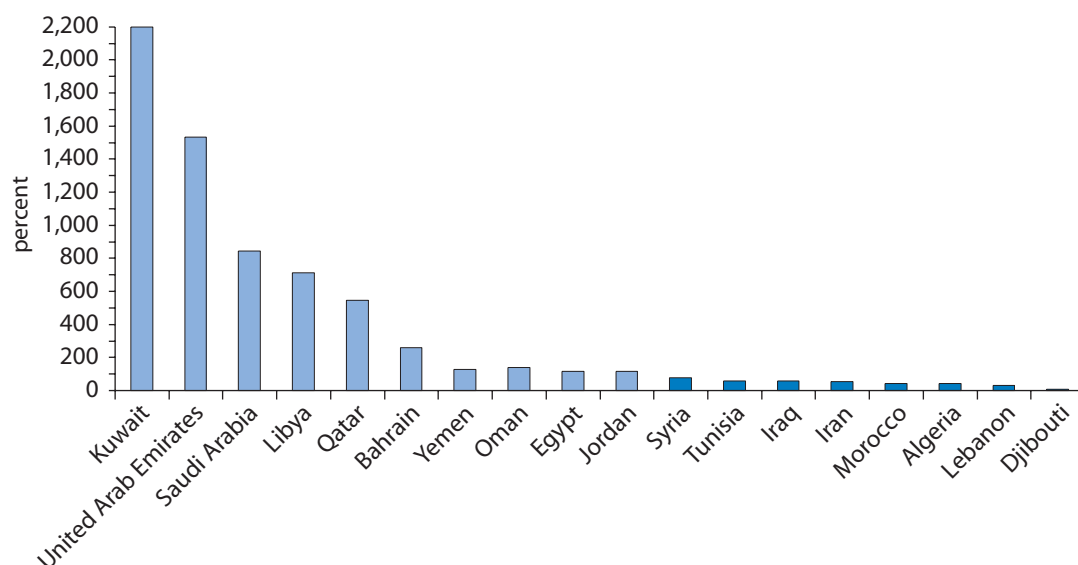
Source: FAO AQUASTAT; Palestinian Water Authority.

Nonrenewable groundwater: Groundwater resources that are naturally replenished only over a very long timeframe. Generally, they have a negligible rate of recharge on the human scale (<1 percent) and thus can be considered nonrenewable. In practice, nonrenewable groundwater refers to aquifers with large stocking capacity in relation to the average annual volume discharged. Figures included in this table are the best estimate of annual withdrawals.

Sources: FAO AQUASTAT database and country profiles; UNESCO-IHP 2005; Yemen National Water Resource Agency; Palestinian Water Authority.

Virtual water: Virtual water is water used to produce food products that are traded across international borders. It is the quantity of water that would have been necessary for producing the same amount of food that a country may be exporting or importing. These figures reflect both crop and livestock net imports. Data on virtual water are an average from 1995–99.

Sources: Hoekstra and Hung 2002; Chapagain and Hoekstra 2003.

FIGURE A1.6**Total Water Withdrawal as a Percentage of Total Renewable Water Resources**

Source: Table A1.6.

Note: Values above 100 percent indicate withdrawal of nonrenewable groundwater resources or use of desalinated and other supplemental water resources that are not included in the total annual water resources figures. Bars in darker color are below 100 percent.

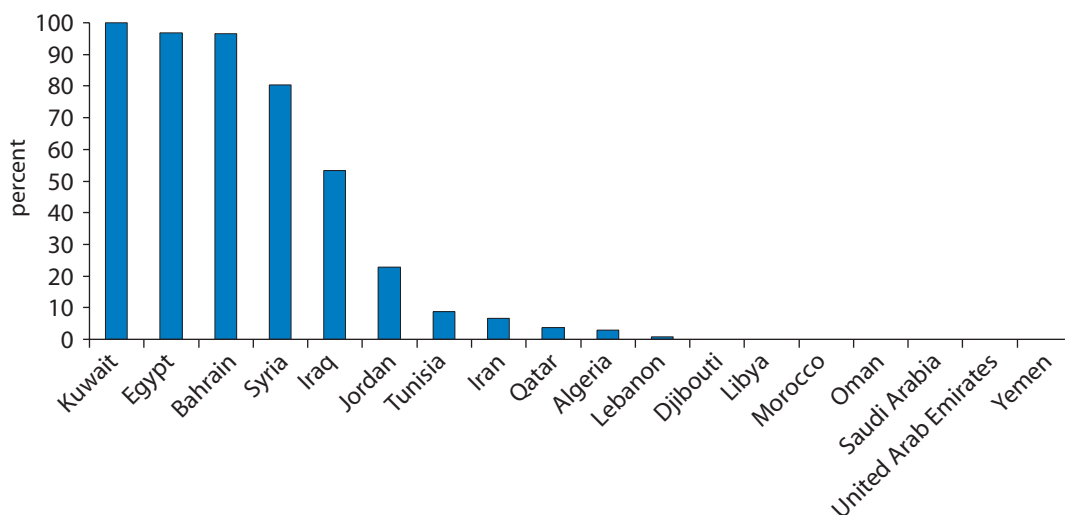
TABLE A1.6**Total Water Withdrawal as a Percentage of Total Renewable Water Resources**

Country	Total water withdrawal as percentage of total renewable water resources
Kuwait	2,200.0
United Arab Emirates	1,533.3
Saudi Arabia	845.8
Libya	711.3
Qatar	547.2
Bahrain	258.6
Oman	138.1
Yemen	125.9
Egypt	117.2
Jordan	114.8
Syria	76.0
Tunisia	57.5
Iraq	56.6
Iran	53.0
Morocco	43.4
Algeria	42.4
Lebanon	31.3
Djibouti	6.3

Source: FAO AQUASTAT 1998–2002.

FIGURE A1.7

Dependency Ratio



Source: Table A1.7.

Note: Dependency ratio expresses the share of the total renewable water resources originating outside the country as a percentage. This indicator may theoretically vary between 0 percent (the country receives no water from neighboring countries) and 100 percent (country receives all its water from outside). This ratio does not consider the possible allocation of water to downstream countries. No data available for West Bank and Gaza. Actual dependence on external sources is lower in some countries than these numbers suggest, notably Kuwait and Bahrain, because these figures do not consider use of internal nonrenewable groundwater and supplemental water sources.

TABLE A1.7

Dependency Ratio

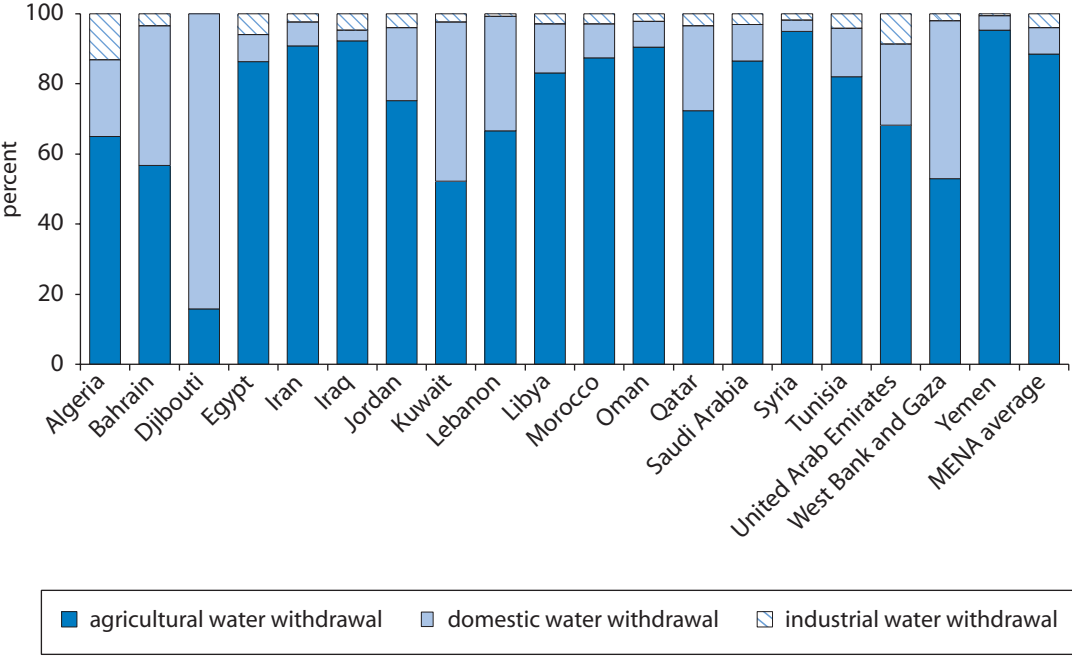
Country	Dependency ratio
Kuwait	100.0
Egypt	96.9
Bahrain	96.6
Syria	80.3
Iraq	53.3
Jordan	22.7
Tunisia	8.7
Iran	6.6
Qatar	3.8
Algeria	2.9
Lebanon	0.8
Djibouti	0.0
Libya	0.0
Morocco	0.0
Oman	0.0
Saudi Arabia	0.0
United Arab Emirates	0.0
Yemen	0.0

Source: FAO AQUASTAT 1998–2002.

Note: Actual dependence on external sources is lower in some countries than these numbers suggest, notably Kuwait and Bahrain, because these figures do not consider use of internal nonrenewable groundwater and supplemental water sources.

FIGURE A1.8

Water Withdrawal, by Sector



Source: Table A1.8.

Note: Water withdrawal (water abstraction) is the gross amount of water extracted from any source, either permanently or temporarily, for a given use. It can be either diverted toward distribution networks or directly used. It includes consumptive use, conveyance losses, and return flow. Total water withdrawal is the sum of estimated water use by the agricultural, domestic, and industrial sectors.

TABLE A1.8

Water Withdrawal, by Sector

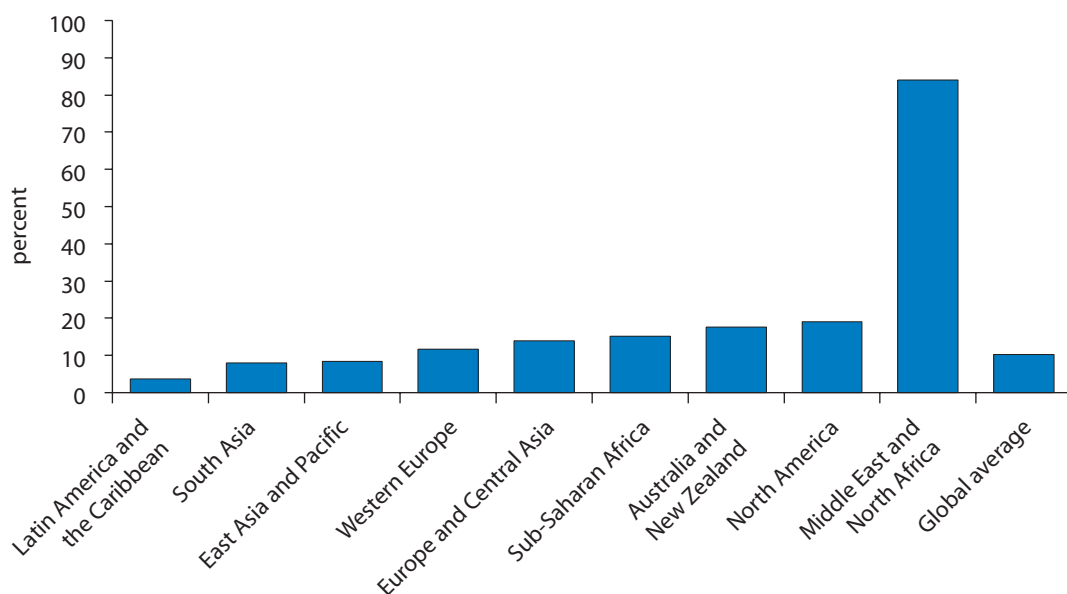
Country	Water withdrawal volume (km ³ /year) per sector			Percentage water withdrawal per sector		
	Agriculture	Domestic	Industry	Agriculture	Domestic	Industry
Algeria	3.9	1.3	0.8	64.9	21.9	13.2
Bahrain	0.2	0.1	0.0	56.7	40.0	3.3
Djibouti	0.0	0.0	0.0	15.8	84.2	0.0
Egypt	59.0	5.3	4.0	86.4	7.8	5.9
Iran	66.2	5.0	1.7	90.9	6.8	2.3
Iraq	39.4	1.4	2.0	92.2	3.2	4.6
Jordan	0.8	0.2	0.0	75.3	20.8	4.0
Kuwait	0.2	0.2	0.0	52.3	45.5	2.3
Lebanon	0.9	0.5	0.0	66.7	32.6	0.7
Libya	3.5	0.6	0.1	83.0	14.1	2.9
Morocco	11.0	1.2	0.4	87.4	9.8	2.9
Oman	1.2	0.1	0.0	90.4	7.4	2.2
Qatar	0.2	0.1	0.0	72.4	24.1	3.5
Saudi Arabia	17.5	2.1	0.6	86.5	10.4	3.1
Syria	18.9	0.7	0.4	94.9	3.3	1.8
Tunisia	2.2	0.4	0.1	82.0	13.8	4.2
United Arab Emirates	1.6	0.5	0.2	68.3	23.0	8.7
West Bank and Gaza	0.2	0.1	0.0	53.0	45.0	2.0
Yemen	6.3	0.3	0.0	95.3	4.1	0.6
MENA average	74.4	22.0	3.6	12.3	1.1	0.5

Source: FAO AQUASTAT 1998–2002; West Bank and Gaza, Palestinian Water Authority; Saudi Arabia, Ministry of Economy and Planning 2004.

Note: MENA average is not weighted by population.

FIGURE A1.9

Water Stored in Reservoirs as a Percentage of Total Renewable Water Resources



Source: Table A1.9.

TABLE A1.9

Water Stored in Reservoirs as a Percentage of Total Renewable Water Resources

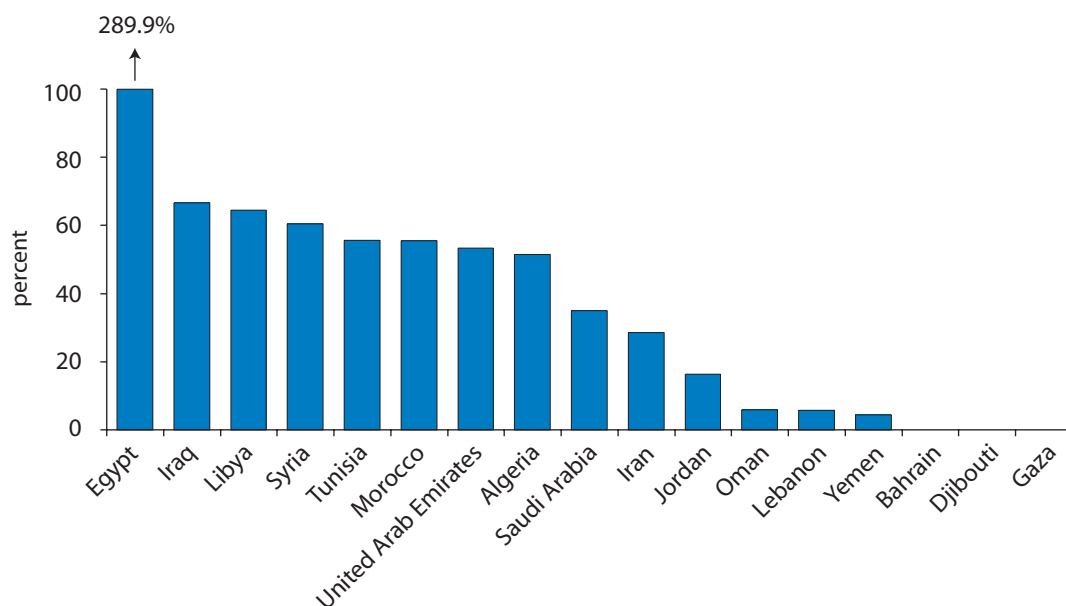
Region	Percentage of total renewable water resources stored in reservoirs
Latin America and the Caribbean	3.8
South Asia	7.9
East Asia and Pacific	8.4
Western Europe	11.7
Europe and Central Asia	14.0
Sub-Saharan Africa	15.2
Australia and New Zealand	17.6
North America	19.0
Middle East and North Africa	84.0
Global average	10.2

Sources: FAO AQUASTAT 1998–2002; International Journal of Hydropower and Dams 2005; International Commission on Large Dams 2003.

Note: Where more than one estimate was available for a country, the higher one was used.

FIGURE A1.10

Dam Capacity as a Percentage of Total Renewable Water Resources in MENA



Source: Table A1.10.

Note: Upstream transboundary waters flowing into the Aswan High Dam increase Egypt's dam capacity beyond total renewable water resources for Egypt.

TABLE A1.10

Dam Capacity as a Percentage of Total Renewable Water Resources in MENA

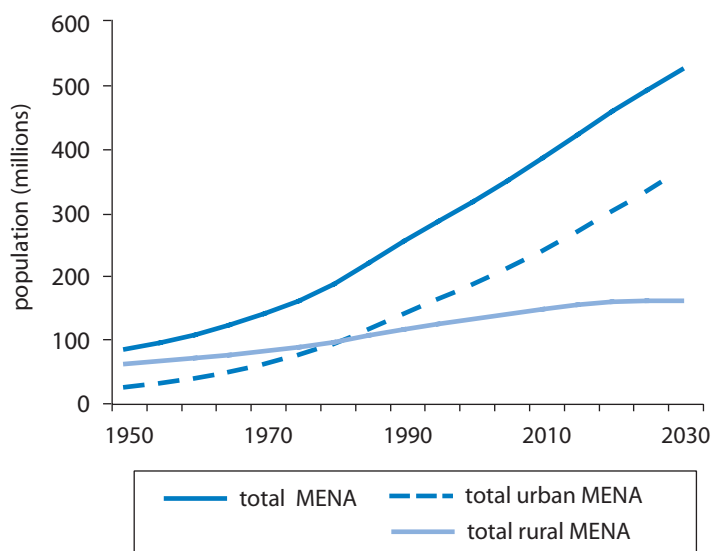
Country	Estimated total dam capacity (km ³)	Dam capacity as percentage of total renewable
Egypt	169.0	289.9
Iraq	50.2	66.6
Libya	0.4	64.5
Syria	15.9	60.4
Tunisia	2.6	55.6
Morocco	16.1	55.5
United Arab Emirates	0.1	53.3
Algeria	6.0	51.5
Saudi Arabia	0.8	35.0
Iran	39.2	28.5
Jordan	0.1	16.3
Oman	0.1	5.9
Lebanon	0.3	5.7
Yemen	0.2	4.4
Bahrain	0.0	0.0
Djibouti	0.0	0.0
Gaza	0.0	0.0

Sources: FAO AQUASTAT 1998–2002; International Journal of Hydropower and Dams 2005; International Commission on Large Dams 2003.

Note: Where more than one estimate was available for dam capacity in a country, the higher one was used.

FIGURE A1.11

MENA Region Rural and Urban Population Trends, 1950–2030



Source: Table A1.11.

TABLE A1.11

MENA Region Rural and Urban Population Trends, 1950–2030 (millions)

Year	Total MENA	Total urban MENA	Total rural MENA
1950	82.2	22.9	59.3
1955	92.9	28.8	64.0
1960	105.4	36.6	68.8
1965	120.5	47.1	73.4
1970	138.2	59.1	79.1
1975	159.0	73.6	85.5
1980	184.8	91.2	93.6
1985	218.7	114.7	104.0
1990	252.7	138.7	114.0
1995	284.3	161.9	122.3
2000	315.0	185.2	129.8
2005	348.3	210.6	137.7
2010	384.1	238.5	145.7
2015	421.4	268.8	152.5
2020	457.4	300.3	157.1
2025	491.4	332.3	159.0
2030	524.0	365.0	159.0

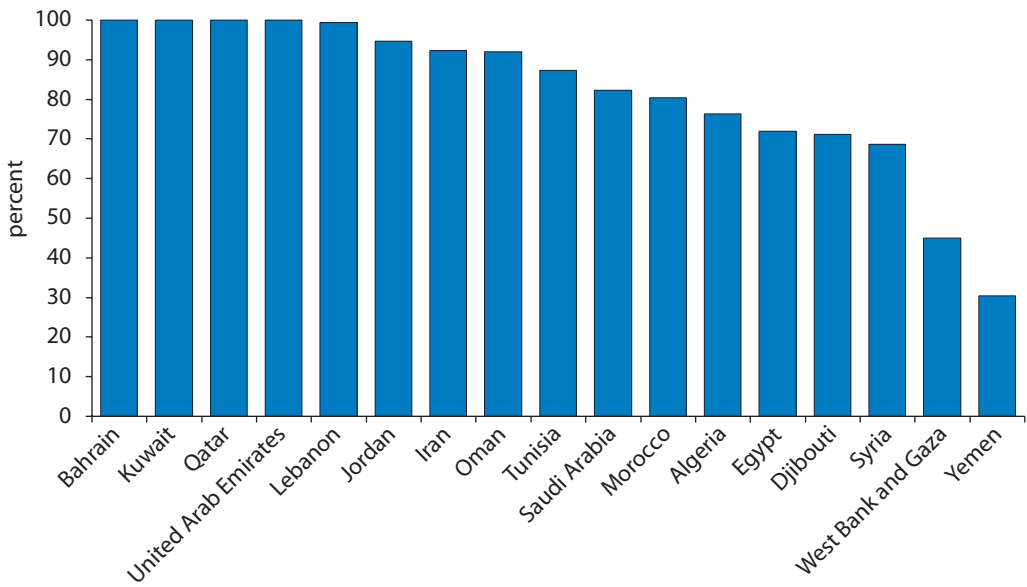
Source: United Nations Population Division, World Urbanization Prospects, 2003.

Note: Data are inclusive of the Iranian and Israeli populations.

Water Services Data

FIGURE A2.1

Percent with Access to Water Services

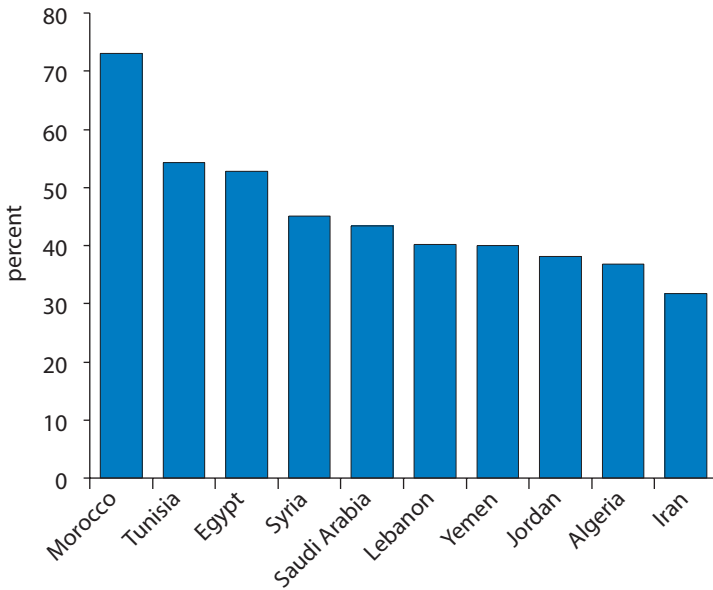


Source: Country profiles in appendix 3 of this report.

Note: Access to water services is an index reflecting a combination of factors: access to water supply, access to sanitation, and hours of service in major cities.

FIGURE A2.2

Water Requirement Ratio

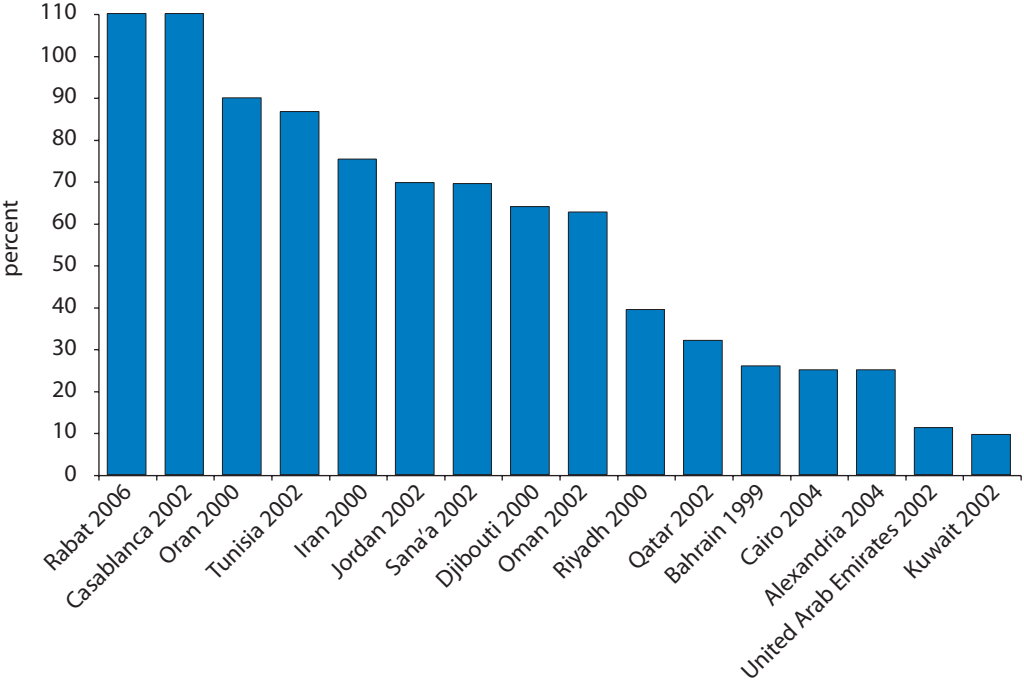


Source: FAO AQUASTAT database.

Note: The water requirement ratio measures the efficiency of water use in agriculture. It is computed based on the existing cropping pattern, evapotranspiration, and climatic conditions in the country during the year considered. A ratio close to one implies high efficiency of irrigation under the existing irrigation system and cropping pattern and a ratio close to zero implies low efficiency. However, measuring efficiency of water used in irrigation is complex. Assessing the impact of irrigation on water resources requires an estimate of the water effectively withdrawn for irrigation, that is, the volume of water extracted from rivers, lakes, and aquifers for irrigation purposes. Irrigation water withdrawal normally far exceeds the consumptive use of irrigation because much water withdrawn does not actually reach the crops. The ratio between the estimated irrigation water requirements and the actual irrigation water withdrawal is often referred to as "irrigation efficiency." However, the use of the words "irrigation efficiency" is currently the subject of debate (FAO Aquastat). The word "efficiency" implies that water is being wasted when the efficiency is low. This is not necessarily so. Unused water can be used further downstream in the irrigation scheme, it can flow back to the river, or it can contribute to the recharge of aquifers. Thus, "water requirement ratio" is used in this report to indicate the ratio between irrigation water requirements and the amount of water withdrawn for irrigation. Specifics on how calculations were conducted can be found at the following Web site: http://www.fao.org/AG/agl/aglw/aquastat/water_use/index5.stm. No data were available for Bahrain, Djibouti, Kuwait, Oman, and the United Arab Emirates.

FIGURE A2.3

Operating Cost Coverage Ratio for Utilities in Selected Countries and Major Cities in MENA



Source: Table A2.1.

Note: Operating cost coverage defines the operating efficiency of a utility. The operating cost coverage ratio is the total annual operational revenue divided by total annual operating cost. Data refer to the specific city; when a national average is available it is also reported. Where national data are not available, data for the capital city or other cities with a population over 1 million are used. Operating costs include depreciation for all utilities except those in Gulf Cooperation Council countries.

TABLE A2.1

Sources for Operating Cost Coverage Ratios

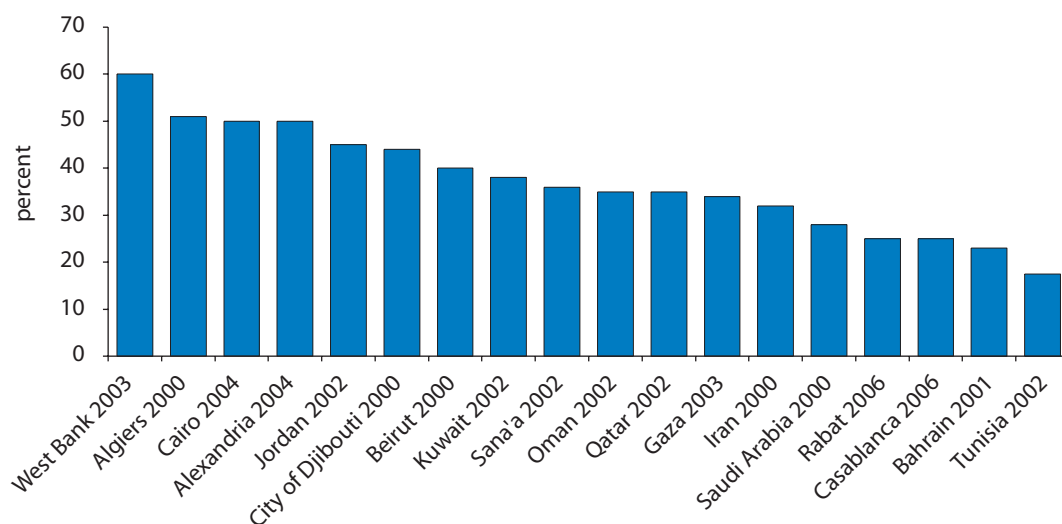
Country and data year	City and data year	Operating cost coverage (ratio)	Source
Morocco	Rabat 2006	1.10	World Bank 2006e
Morocco	Casablanca 2006	1.10	World Bank 2006e
Algeria	Oran 2000	0.90	IBNET database
Tunisia 2002	n.a.	0.87	World Bank 2005g
Iran 2000	n.a.	0.75	World Bank 2005f
Jordan 2002	n.a.	0.70	Stone and Webster 2004
Yemen	Sana'a 2002	0.69	Figure provided by Yemeni Water Companies
Djibouti 2000	n.a.	0.64	World Bank 2004k
Oman 2002	n.a.	0.63	World Bank 2005l
Saudi Arabia	Riyadh 2000	0.39	IBNET database
Saudi Arabia	Medina 2000	0.34	IBNET database
Qatar 2002	n.a.	0.32	World Bank 2005l
Bahrain 1999	n.a.	0.26	World Bank 2005l
Egypt	Cairo 2004	0.25	World Bank 2005b
Egypt	Alexandria 2004	0.25	World Bank 2005b
United Arab Emirates 2002	n.a.	0.11	World Bank 2005l
Kuwait 2002	n.a.	0.10	Kuwait Ministry of Energy and Water 2003

Source: Appendix 3 of this report.

Note: n.a.= Not applicable.

FIGURE A2.4

Nonrevenue Water Ratio for Utilities in Selected Countries and Major Cities in MENA



Source: Table A2.2.

Note: Nonrevenue water is water loss, including apparent loss from unauthorized consumption and metering inaccuracies, and real loss from leakages on transmission or distribution mains, at utilities, or leakage on service connections up to point of customer metering. Where there is no national data, data for cities with a population over 1 million are used.

TABLE A2.2**Sources for Nonrevenue Water Ratio**

Country and data year	City and data year	Nonrevenue water (ratio)	Source
West Bank and Gaza	West Bank	0.60	USAID and PWA 2003
Algeria	Algiers 2000	0.51	World Bank and FAO 2003
Egypt	Cairo 2004	0.50	World Bank 2005b
Egypt	Alexandria 2004	0.50	World Bank 2005b
Jordan 2002	n.a.	0.45	Stone and Webster 2004
Djibouti	City of Djibouti 2000	0.44	World Bank 2004k
Lebanon	Beirut 2000	0.40	IBNET database
Kuwait 2002	n.a.	0.38	World Bank 2005l
Yemen	Sana'a 2002	0.36	IBNET database
Oman 2002	n.a.	0.35	World Bank 2005l
Qatar 2002	n.a.	0.35	World Bank 2005l
West Bank and Gaza	Gaza	0.34	World Bank 2006b
Iran 2000	n.a.	0.32	World Bank 2005f
Saudi Arabia 2000	n.a.	0.28	IBNET database
Morocco	Rabat 2006	0.25	World Bank 2006e
Morocco	Casablanca 2006	0.25	World Bank 2006e
Bahrain 2001	n.a.	0.23	World Bank 2005l
Tunisia 2002	n.a.	0.18	IBNET database

Source: Data from appendix 3 of this report.

Country Profiles

Data notes

Data in the country tables may differ from other data found in World Bank publications because of differences in computation methodologies. Information from non-World Bank sources, without either endorsement or verification, is reported in the interest of providing as full a country overview as possible for each country. Countries for which insufficient standardized data are available are not included.

For definitions of indicators, please see page 194.

Data sources

WDI database: World Development Indicators, The World Bank, 1818 H Street NW, Washington, D.C. 20433-USA

UNICEF-WHO database: This is an online database maintained by UNICEF. The URL for this database is <http://www.unicef.org/infobycountry/northafrica.html>

FAO AQUASTAT: AQUASTAT is the global information system on water and agriculture developed by the Land and Water Development Division of the Food and Agricultural Organization. The URL for this database is <http://www.fao.org/AG/AGL/aglw/aquastat/main/index.stm>

IBNET database: This is an online database maintained by the International Benchmarking Network for Water and Sanitation Utilities (IBNET). The URL for this database is <http://www.ib-net.org/en/search/>

WRI Earthtrends database: This is an online database maintained by the World Resources Institute (WRI). The URL for this database is <http://earthtrends.wri.org/>

Algeria

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	32.4	294	WDI database
Urban population	19.2	172.5	WDI database
Rural population	13.2	121.5	WDI database
Population with access to improved drinking water (%), 2002	87	90	UNICEF-WHO database
Urban	92	96	UNICEF-WHO database
Rural	80	81	UNICEF-WHO database
Hours of access to tap water in Algiers (hours/day)	12	n.a.	Expert opinion
Percentage of population with access to improved sanitation, 2002	92	76	UNICEF-WHO database
Urban	99	90	UNICEF-WHO database
Rural	82	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	41	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	2,280	2,000	WDI database
GDP (millions of constant US\$ at 2000 prices), 2004	64,146	—	WDI database
Share of agriculture in GDP (%), 2004	12.7	13.6	WDI database
Share of industry in GDP (%), 2004	73.5	39.2	WDI database
Share of oil in GDP (%), 2003	36.2	—	WDI database
Average annual growth			
Average annual growth of GDP at constant prices	4.2	4.3	WDI database
Average annual growth of GDP per capita at constant prices	2.6	2.5	WDI database
Average annual growth of population	1.6	1.9	WDI database
Land and water resources			
Land area (million hectares)	238.2	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	89	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	13.2	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	1.7	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	13.9	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.4	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	14.3	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	11.2	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.44	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	235.9	133.0	FAO AQUASTAT
Dependency ratio (%)	2.9	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	3.9	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	1.3	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.8	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	6.1	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	9.8	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	1.1	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	10.9	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0	4.8	FAO AQUASTAT

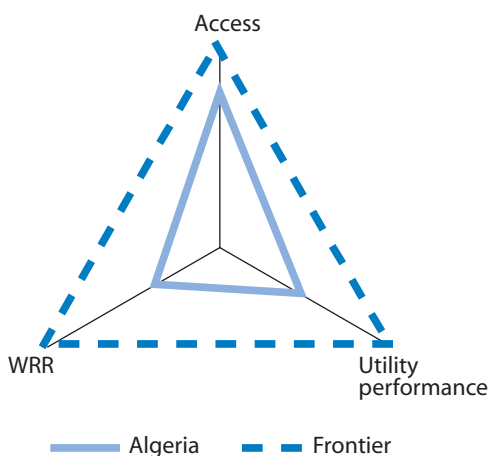
Algeria (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	39.8	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	34	—	Chapagain and Hoekstra 2003
Water dependency (%)	66	—	Chapagain and Hoekstra, 2003
Public utility performance in major cities			
Operating cost coverage ratio, City of Oran, 2000	0.90	n.a.	IBNET database
Nonrevenue water , City of Algiers, 2000	0.51	n.a.	World Bank and FAO 2003
Efficiency of water used in agriculture			
Water requirement ratio	0.37	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	4,411.4	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	1,120.3	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	6.8	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	31.3	32.0	World Bank 2003a
Index of quality of administration	41.0	47.0	World Bank 2003a
Index of governance quality	32.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.1

Algeria's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Algeria	0.76	0.49	0.37

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

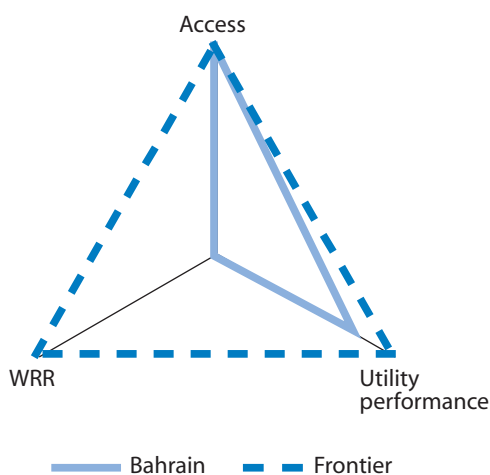
Bahrain

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	0.73	294	WDI database
Urban population	0.65	172.5	WDI database
Rural population	0.07	121.5	WDI database
Population with access to improved drinking water (%), 2002	100	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	100	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	100	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	100	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2002	15	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	12,410	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	9,370	—	WDI database
Share of agriculture in GDP (%), 2004	—	13.6	WDI database
Share of industry in GDP (%), 2004	—	39.2	WDI database
Share of oil in GDP (%), 2003	22.1	—	WDI database
Average annual growth			
Average annual growth of GDP at constant prices	5.5	4.3	WDI database
Average annual growth of GDP per capita at constant prices ³	3.4	2.5	WDI database
Average annual growth of population	2.0	1.9	WDI database
Land and water resources			
Land area (million hectares)	0.07	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	83	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0	77.2	FAO AQUASTAT
Total internal water resources (1,000 m ³)	0	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.1	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.1	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.16	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	37.3	133.0	FAO AQUASTAT
Dependency ratio (%)	96.6	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.1	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	0.3	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	0.1	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	0.5	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.04	4.8	FAO AQUASTAT

Bahrain (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	236.3	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	37	—	Chapagain and Hoekstra 2003
Water dependency (%)	63	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio, 1999	0.26	n.a.	World Bank 2005I
Nonrevenue water, 2001	0.23	n.a.	World Bank 2005I
Efficiency of water used in agriculture			
Water requirement ratio	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	50.5	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	296.9	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	83.3	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	31.5	32.0	World Bank 2003a
Index of quality of administration	66.0	47.0	World Bank 2003a
Index of governance quality	50.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.2**Bahrain's Position on Three Dimensions of Water Service**

	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Bahrain	1.00	0.77	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Djibouti

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	0.72	294	WDI database
Urban population	0.61	172.5	WDI database
Rural population	0.11	121.5	WDI database
Population with access to improved drinking water (%), 2002	80	90	UNICEF-WHO database
Urban	82	96	UNICEF-WHO database
Rural	67	81	UNICEF-WHO database
Hours of access to tap water in City of Djibouti (hours/day)	20	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	50	76	UNICEF-WHO database
Urban	55	90	UNICEF-WHO database
Rural	27	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	138	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	1,030	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	616	—	WDI database
Share of agriculture in GDP (%), 2004	3.7	13.6	WDI database
Share of industry in GDP (%), 2004	14.2	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	2.3	4.3	WDI database
Average annual growth of GDP per capita at constant prices	0.4	2.5	WDI database
Average annual growth of population	1.9	1.9	WDI database
Land and water resources			
Land area (million hectares)	2.3	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	220	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.3	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	0.3	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.3	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.4	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	1578.9	133.0	FAO AQUASTAT
Dependency ratio (%)	0.00	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.00	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.02	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.00	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	0.02	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	0.1	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.0	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	0.1	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0	4.8	FAO AQUASTAT

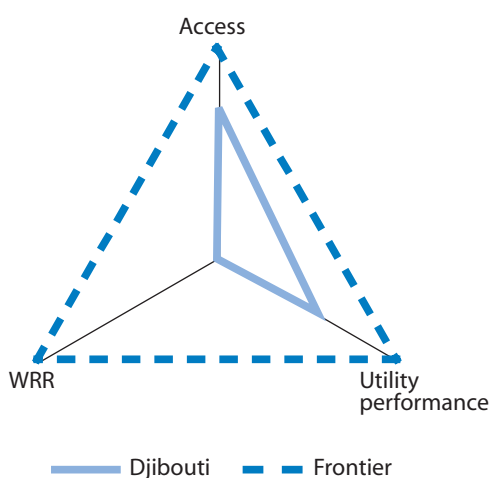
Djibouti (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	—	—	
Water self-sufficiency (%)	—	—	
Water dependency (%)	—	—	
Public utility performance in major cities			
Operating cost coverage ratio	0.64	n.a.	World Bank 2004k
Nonrevenue water, City of Djibouti	0.44	n.a.	World Bank 2004k
Efficiency of water used in agriculture			
Water requirement ratio	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	18.2	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	2,606.0	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	—	45.7	
Governance indicators			
Index of public accountability	—	32.0	World Bank 2003a
Index of quality of administration	—	47.0	World Bank 2003a
Index of governance quality	—	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.3

Djibouti's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Djibouti	0.71	0.56	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Egypt

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	68.7	294	WDI database
Urban population	29.0	172.5	WDI database
Rural population	39.7	121.5	WDI database
Population with access to improved drinking water (%), 2002	98	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	97	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	12	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	68	76	UNICEF-WHO database
Urban	84	90	UNICEF-WHO database
Rural	56	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births; 2002	39	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	1,310	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	114,312	—	WDI database
Share of agriculture in GDP (%), 2004	15.5	13.6	WDI database
Share of industry in GDP (%), 2004	32.1	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	3.8	4.3	WDI database
Average annual growth of GDP per capita at constant prices	2.0	2.5	WDI database
Average annual growth of population	1.8	1.9	WDI database
Land and water resources			
Land area (million hectares)	100.1	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	51	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.5	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	1.3	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	1.8	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	56.5	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	58.3	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	0.5	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.8	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	85.4	133.0	FAO AQUASTAT
Dependency ratio (%)	96.9	—	WDI database
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	59.0	188.3	WDI database
Domestic (1,000 million m ³)	5.3	17.5	WDI database
Industrial (1,000 million m ³)	4.0	7.9	WDI database
Total withdrawals (1,000 million m ³)	68.3	213.8	WDI database
Virtual water			
Virtual water imports in crops (1,000 million m ³)	16,035.5	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	2,897.0	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	18.9	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	3.1	4.8	FAO AQUASTAT

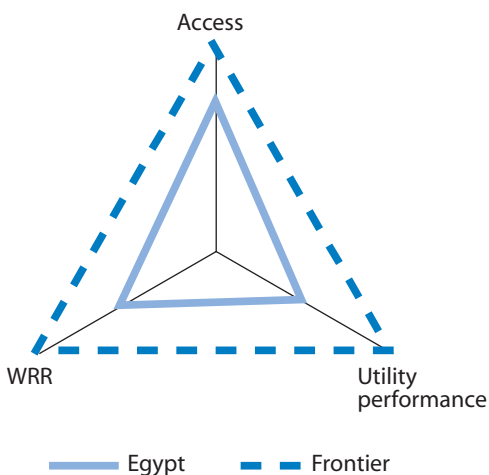
Egypt (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	105.8	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	77	—	Chapagain and Hoekstra 2003
Water dependency (%)	23	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio for all utilities in Egypt	0.25	n.a.	World Bank 2005b
Nonrevenue water, Alexandria and Cairo	0.50	n.a.	World Bank 2005b
Efficiency of water used in agriculture			
Water requirement ratio	0.53	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	15,513.0	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	288.1	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	100.0	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	30.0	32.0	World Bank 2003a
Index of quality of administration	38.0	47.0	World Bank 2003a
Index of governance quality	30.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.4

Egypt's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Egypt	0.72	0.50	0.53

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Iran

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	66.9	294	WDI database
Urban population	45.1	172.5	WDI database
Rural population	21.9	121.5	WDI database
Population with access to improved drinking water (%), 2002	93	90	UNICEF-WHO database
Urban	98	96	UNICEF-WHO database
Rural	83	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	World Bank 2002b
Percentage of population with access to improved sanitation, 2002	84	76	UNICEF-WHO database
Urban	86	90	UNICEF-WHO database
Rural	78	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	39	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	2,300	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	121,288	—	WDI database
Share of agriculture in GDP (%), 2004	10.9	13.6	WDI database
Share of industry in GDP (%), 2004	41.0	39.2	WDI database
Share of oil in GDP (%), 2003	11.6	—	World Bank database
Average annual growth			
Average annual growth of GDP at constant prices	5.8	4.3	WDI database
Average annual growth of GDP per capita at constant prices	4.4	2.5	WDI database
Average annual growth of population	1.3	1.9	WDI database
Land and water resources			
Land area (million hectares)	164.8	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	228.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	97.3	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	49.3	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	128.5	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	9.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	137.5	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	2.0	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	188.7	133.0	FAO AQUASTAT
Dependency ratio (%)	6.6	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	66.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	5.0	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	1.7	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	72.9	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	5.8	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	1.0	14.4	Chapagain and Hoekstra, 2003
Total virtual water (1,000 million m ³)	6.8	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra, 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0	4.8	FAO AQUASTAT

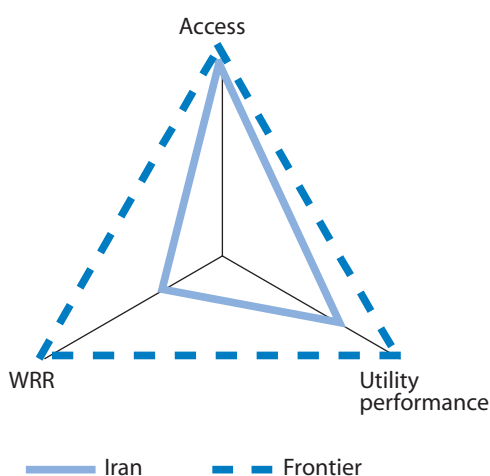
Iran (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	52.8	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	91	—	Chapagain and Hoekstra 2003
Water dependency (%)	9	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Hours of access to tap water (hours/day), Tehran	24	n.a.	World Bank 2002b
Operating cost coverage ratio, Tehran	0.83	n.a.	World Bank 2002b
Nonrevenue water, Tehran	0.39	n.a.	World Bank 2002b
Hours of access to tap water (hours/day), Ahwaz	24	n.a.	World Bank 2002b
Operating cost coverage ratio, Ahwaz	0.78	n.a.	World Bank 2002b
Nonrevenue water (unaccounted for Water, UFW), Ahwaz	0.46	n.a.	World Bank 2002b
Hours of access to tap water (hours/day), Shiraz	24	n.a.	World Bank 2002b
Operating cost coverage ratio, Shiraz	0.65	n.a.	World Bank 2002b
Nonrevenue water (UFW), Shiraz	0.28	n.a.	World Bank 2002b
Operating cost coverage ratio, all utilities	0.75	n.a.	World Bank 2002b
Nonrevenue water (UFW), all utilities	0.32	n.a.	World Bank 2002b
Efficiency of water used in agriculture			
Water requirement ratio	0.32	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	13,807.2	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	208.5	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	39.3	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	44.0	32.0	World Bank 2003a
Index of quality of administration	29.7	47.0	World Bank 2003a
Index of governance quality	30.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.5

Iran's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Iran	0.92	0.68	0.32

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Jordan

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	5.4	294	WDI database
Urban population	4.3	172.5	WDI database
Rural population	1.1	121.5	WDI database
Population with access to improved drinking water (%), 2002	91	90	UNICEF-WHO database
Urban	91	96	UNICEF-WHO database
Rural	91	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	93	76	UNICEF-WHO database
Urban	94	90	UNICEF-WHO database
Rural	85	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	28.0	55.9	WHO-UNICEF
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	2,140	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	10,378	—	WDI database
Share of agriculture in GDP (%), 2004	2.1	13.6	WDI database
Share of industry in GDP (%), 2004	25.3	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	5.1	4.3	WDI database
Average annual growth of GDP per capita at constant prices	2.2	2.5	WDI database
Average annual growth of population	2.8	1.9	WDI database
Land and water resources			
Land area (million hectares)	8.9	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	111	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.4	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0.5	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	0.7	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.2	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.9	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.2	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	87.1	133.0	FAO AQUASTAT
Dependency ratio (%)	22.7	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.8	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.2	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	1.0	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	4.5	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.6	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	5.0	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.1	4.8	FAO AQUASTAT

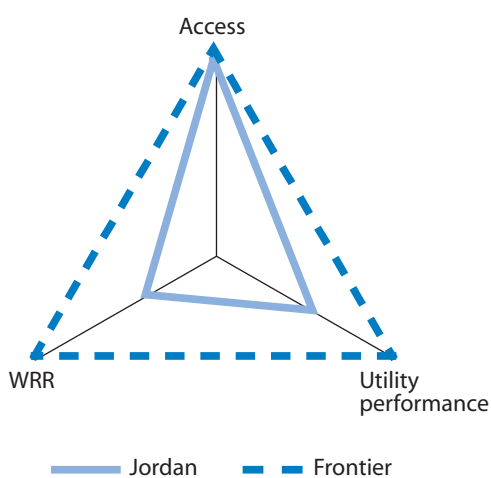
Jordan (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	114.5	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	17	—	Chapagain and Hoekstra 2003
Water dependency (%)	83	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio, 2002	0.70	n.a.	Stone and Webster 2004
Unaccounted for water, all utilities, 2002	0.45	n.a.	Stone and Webster 2004
Efficiency of water used in agriculture			
Water requirement ratio	0.38	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	165.0	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	217.1	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	19.4	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	45.0	32.0	World Bank 2003a
Index of quality of administration	50.7	47.0	World Bank 2003a
Index of governance quality	44.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.6

Jordan's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Jordan	0.95	0.55	0.38

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

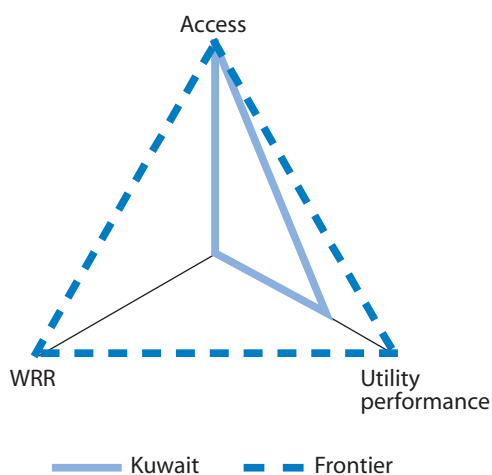
Kuwait

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	2.46	294	WDI database
Urban population	2.37	172.5	WDI database
Rural population	0.09	121.5	WDI database
Population with access to improved drinking water (%), 2002	100	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	100	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	100	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	100	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2002	9.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	17,970	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	40,111	—	WDI database
Share of agriculture in GDP (%), 2004	—	13.6	WDI database
Share of industry in GDP (%), 2004	—	39.2	WDI database
Share of oil in GDP (%), 2000	57.4	—	IMF Report
Average annual growth			
Average annual growth of GDP at constant prices	3.1	4.3	WDI database
Average annual growth of GDP per capita at constant prices	-0.2	2.5	WDI database
Average annual growth of population	3.1	1.9	WDI database
Land and water resources			
Land area (million hectares)	1.8	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	121	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	0	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.0	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.1	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	4.5	133.0	FAO AQUASTAT
Dependency ratio (%)	100.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.2	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	0.4	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	0.5	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.9	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	1.4	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.3	4.8	FAO AQUASTAT

Kuwait (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	2,070	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	23	—	Chapagain and Hoekstra 2003
Water dependency (%)	77	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio; 2002	0.10	n.a.	Kuwait Ministry of Energy and Water 2003
Nonrevenue water, whole country, 2002	0.38	n.a.	World Bank 2005I
Efficiency of water used in agriculture			
Water requirement ratio ⁵	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	114.3	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	496.9	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	100.0	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	44.0	32.0	World Bank 2003a
Index of quality of administration	56.5	47.0	World Bank 2003a
Index of governance quality	48.5	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.7**Kuwait's Position on Three Dimensions of Water Service**

	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Kuwait	1.00	0.62	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Lebanon

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	4.55	294	WDI database
Urban population	3.99	172.5	WDI database
Rural population	0.56	121.5	WDI database
Population with access to improved drinking water (%), 2002	100	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	100	81	UNICEF-WHO database
Hours of access to tap water in Beirut (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	98	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	87	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	31.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	4,980	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	19,848	—	WDI database
Share of agriculture in GDP (%), 2004	12.9	13.6	WDI database
Share of industry in GDP (%), 2004	19.1	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	3.9	4.3	WDI database
Average annual growth of GDP per capita at constant prices	2.6	2.5	WDI database
Average annual growth of population	1.3	1.9	WDI database
Land and water resources			
Land area (million hectares)	1.0	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	661	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	4.1	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	3.2	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	4.8	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	−0.4	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	4.4	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	2.2	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	1.2	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	0.8	133.0	FAO AQUASTAT
Dependency ratio (%)	100	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.9	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.5	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	1.4	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	0.7	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	1.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	2.0	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0	4.8	FAO AQUASTAT

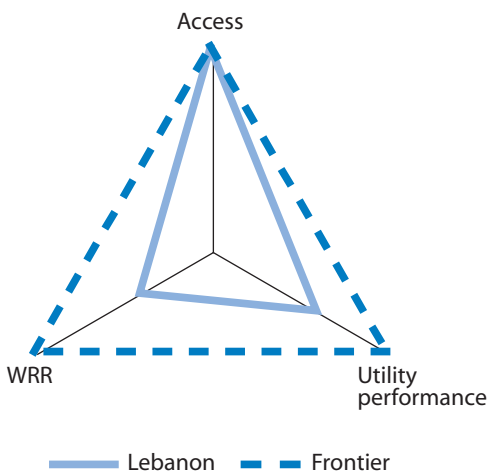
Lebanon (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	33.4	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	42	—	Chapagain and Hoekstra 2003
Water dependency (%)	58	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio	—	n.a.	
Nonrevenue water, Beirut	0.4	n.a.	IBNET database
Efficiency of water used in agriculture			
Water requirement ratio	0.40	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	1,800.1	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	1,956.7	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	39.0	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	42.0	32.0	World Bank 2003a
Index of quality of administration	35.0	47.0	World Bank 2003a
Index of governance quality	32.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.8

Lebanon's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Lebanon	0.99	0.60	0.40

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

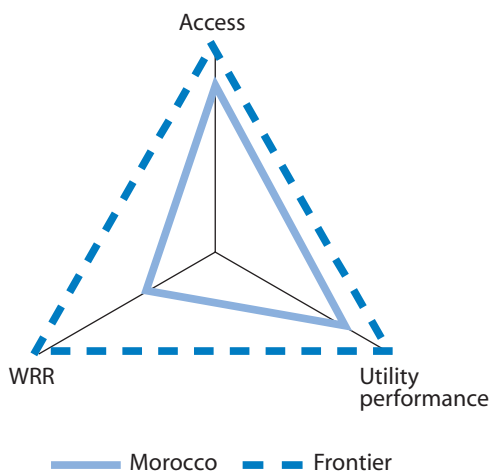
Morocco

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	30.6	294	WDI database
Urban population	17.8	172.5	WDI database
Rural population	12.8	121.5	WDI database
Population with access to improved drinking water (%), 2002	80	90	UNICEF-WHO database
Urban	99	96	UNICEF-WHO database
Rural	56	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	61	76	UNICEF-WHO database
Urban	83	90	UNICEF-WHO database
Rural	31	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	39.0	55.9	WHO-UNICEF
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	1,520	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	39,823	—	WDI database
Share of agriculture in GDP (%), 2004	16.7	13.6	WDI database
Share of industry in GDP (%), 2004	29.8	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	3.8	4.3	WDI database
Average annual growth of GDP per capita at constant prices	2.2	2.5	WDI database
Average annual growth of population	1.6	1.9	WDI database
Land and water resources			
Land area (million hectares)	44.7	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	346.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	22.0	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	10.0	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	29.0	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	29.0	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	20.7	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	1.0	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	230.2	133.0	FAO AQUASTAT
Dependency ratio (%)	0.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	11.0	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	1.2	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.4	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	12.6	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	5.5	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	5.8	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.007	4.8	FAO AQUASTAT

Morocco (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	42.2	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	68	—	Chapagain and Hoekstra 2003
Water dependency (%)	32	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio, City of Casablanca, 2006	1.10	n.a.	World Bank 2006e
Nonrevenue water (Unaccounted for Water, UFW), Casablanca and Rabat, 2006	0.25	n.a.	World Bank 2006e
Efficiency of water used in agriculture			
Water requirement ratio	0.37	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	4,610.5	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	418.8	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	13.8	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	39.0	32.0	World Bank 2003a
Index of quality of administration	51.6	47.0	World Bank 2003a
Index of governance quality	42.7	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.9**Morocco's Position on Three Dimensions of Water Service**

	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Morocco	0.80	0.75	0.37

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Oman

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	2.7	294	WDI database
Urban population	2.1	172.5	WDI database
Rural population	0.6	121.5	WDI database
Population with access to improved drinking water (%), 2002	79	90	UNICEF-WHO database
Urban	81	96	UNICEF-WHO database
Rural	72	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	97	76	UNICEF-WHO database
Urban	97	90	UNICEF-WHO database
Rural	61	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	12.0	55.9	WHO-UNICEF
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	7,890	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	22,259	—	WDI database
Share of agriculture in GDP (%), 2004	—	13.6	WDI database
Share of industry in GDP (%), 2004	—	39.2	WDI database
Share of oil in GDP (%), 2003	25.9	—	WDI database
Average annual growth			
Average annual growth of GDP at constant prices	4.3	4.3	WDI database
Average annual growth of GDP per capita at constant prices	1.7	2.5	WDI database
Average annual growth of population	2.5	1.9	WDI database
Land and water resources			
Land area (million hectares)	31.0	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	125	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.9	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	1.0	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	1.0	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	1.0	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.4	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	72.4	133.0	FAO AQUASTAT
Dependency ratio (%)	0.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	1.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.1	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	1.4	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	1.1	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	1.4	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.0	4.8	FAO AQUASTAT

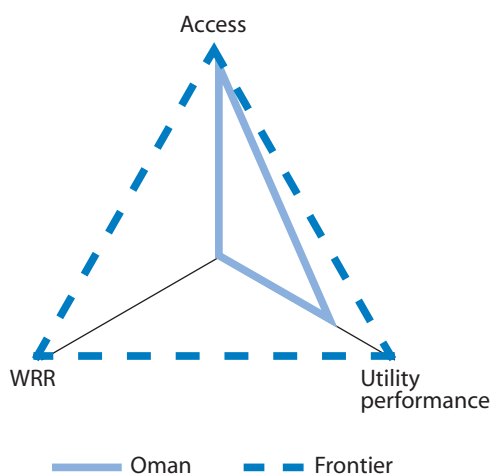
Oman (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	132.2	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	48	—	Chapagain and Hoekstra 2003
Water dependency (%)	52	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio	0.63	n.a.	World Bank 2005I
Nonrevenue water, whole country	0.35	n.a.	World Bank 2005I
Efficiency of water used in agriculture			
Water requirement ratio	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	373.7	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	304.5	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	80.5	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	26.6	32.0	World Bank 2003a
Index of quality of administration	53.0	47.0	World Bank 2003a
Index of governance quality	39.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.10

Oman's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Oman	0.92	0.65	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Qatar

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	0.64	294	WDI database
Urban population	0.59	172.5	WDI database
Rural population	0.05	121.5	WDI database
Population with access to improved drinking water (%), 2002	100	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	100	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert Opinion
Percentage of population with access to improved sanitation, 2002	100	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	100	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	15.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	—	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	—	—	
Share of agriculture in GDP (%), 2004	—	13.6	WDI database
Share of industry in GDP (%), 2004	—	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	—	4.33	WDI database
Average annual growth of GDP per capita at constant prices	—	2.5	WDI database
Average annual growth of population	2.4	1.9	WDI database
Land and water resources			
Land area (million hectares)	1.1	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	74	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.0	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0.1	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	0.1	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.1	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.1	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	18.3	133.0	FAO AQUASTAT
Dependency ratio (%)	3.8	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	0.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.1	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	0.3	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	0.1	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	0.3	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0	4.8	FAO AQUASTAT

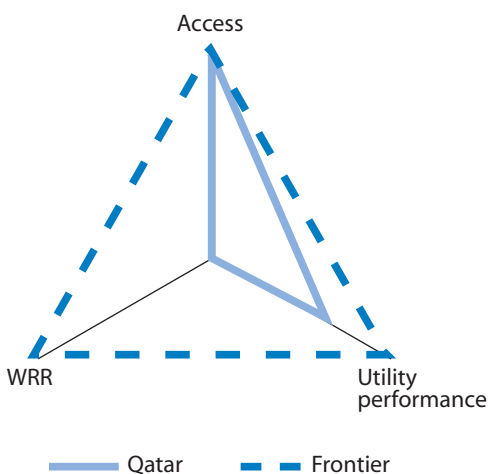
Qatar (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	538.3	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	47	—	Chapagain and Hoekstra 2003
Water dependency (%)	53	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio	0.32	n.a.	World Bank 2005I
Nonrevenue water, whole country	0.35	n.a.	World Bank 2005I
Efficiency of water used in agriculture			
Water requirement ratio	n.a.	—	
Agricultural value-added GDP (millions of current US\$), 2000	—	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	n.a.	701.0	FAO AQUASTAT; WDI database
Percentage of cropped area irrigated (1999)	61.9	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	23.0	32.0	World Bank 2003a
Index of quality of administration	42.0	47.0	World Bank 2003a
Index of governance quality	30.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.11

Qatar's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Qatar	1.00	0.65	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Saudi Arabia

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	23.2	294	WDI database
Urban population	20.4	172.5	WDI database
Rural population	2.8	121.5	WDI database
Population with access to improved drinking water (%), 2002	97	90	UNICEF-WHO database
Urban	97	96	UNICEF-WHO database
Rural	97	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	12	—	IBNET database
Percentage of population with access to improved sanitation, 2002	100	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	100	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	26.0	55.9	WHO-UNICEF
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	10,430	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	214,935	—	WDI database
Share of agriculture in GDP (%), 2004	45.3	13.6	WDI database
Share of industry in GDP (%), 2004	55.2	39.2	WDI database
Share of oil in GDP (%), 2003	35.0	—	WDI database
Average annual growth			
Average annual growth of GDP at constant prices	3.7	4.3	WDI database
Average annual growth of GDP per capita at constant prices	0.8	2.5	WDI database
Average annual growth of population	2.8	1.9	WDI database
Land and water resources			
Land area (million hectares)	215.0	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	59.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	2.2	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	2.2	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	2.4	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	2.4	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.1	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	13.9	133.0	
Dependency ratio (%)	0.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	15.4	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	1.7	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.2	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	17.3	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	10.9	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	2.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	13.1	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.1	4.8	FAO AQUASTAT

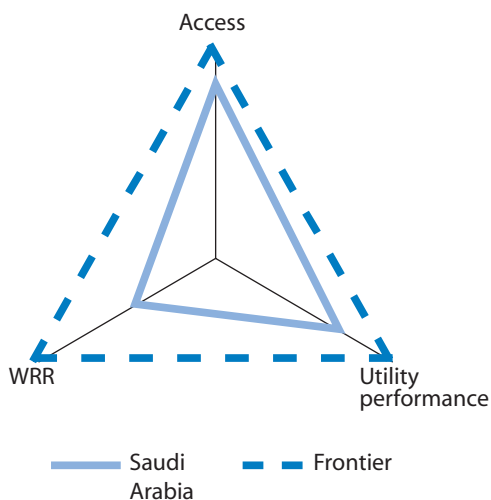
Saudi Arabia (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	713.9	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	57	—	Chapagain and Hoekstra 2003
Water dependency (%)	43	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio, Riyadh, 2000	0.39	n.a.	IBNET database
Operating cost coverage ratio, Meddina, 2000	0.34	n.a.	IBNET database
Nonrevenue water, all utilities, 2000	0.28	n.a.	IBNET database
Efficiency of water used in agriculture			
Water requirement ratio	0.43	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	9,338.6	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	605.4	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	42.8	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	17.0	32.0	World Bank 2003a
Index of quality of administration	48.0	47.0	World Bank 2003a
Index of governance quality	32.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.12

Saudi Arabia's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Saudi Arabia	0.82	0.72	0.43

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Syria

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	17.8	294	WDI database
Urban population	8.9	172.5	WDI database
Rural population	8.9	121.5	WDI database
Population with access to improved drinking water (%), 2002	79	90	UNICEF-WHO database
Urban	94	96	UNICEF-WHO database
Rural	64	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	12	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	77	76	UNICEF-WHO database
Urban	97	90	UNICEF-WHO database
Rural	56	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	18.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	1,190	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	20,442	—	WDI database
Share of agriculture in GDP (%), 2004	24.4	13.6	WDI database
Share of industry in GDP (%), 2004	28.2	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	2.7	4.3	WDI database
Average annual growth of GDP per capita at constant prices	0.2	2.5	WDI database
Average annual growth of population	2.4	1.9	WDI database
Land and water resources			
Land area (million hectares)	18.5	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	252.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	4.8	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	4.2	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	7.0	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	19.3	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	26.3	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	20.6	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	1.5	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	131.6	133.0	
Dependency ratio (%)	80.3	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	18.9	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.7	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.4	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	20.0	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	−4.4	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	−4.1	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	—	4.8	FAO AQUASTAT

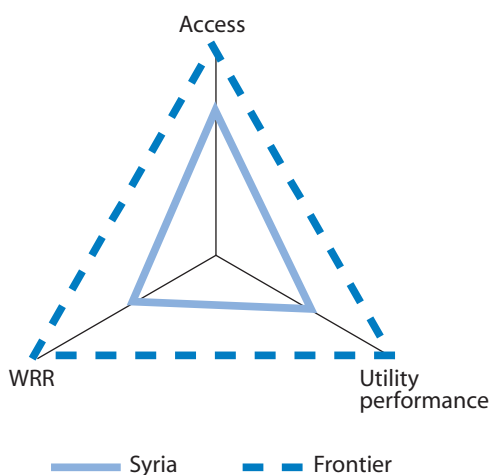
Syria (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	75.3	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	100	—	Chapagain and Hoekstra 2003
Water dependency (%)	—	—	
Public utility performance in major cities			
Operating cost coverage ratio, Damascus	1.14	n.a.	Elhadj 2005
Nonrevenue water, all utilities	0.45	n.a.	Elhadj 2005
Efficiency of water used in agriculture			
Water requirement ratio	0.45	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	4,088.0	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	216.0	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	21.6	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	18.0	32.0	World Bank 2003a
Index of quality of administration	28.0	47.0	World Bank 2003a
Index of governance quality	18.6	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.13

Syria's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Syria	0.69	0.55	0.45

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Tunisia

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	10.0	294	WDI database
Urban population	6.4	172.5	WDI database
Rural population	3.6	121.5	WDI database
Population with access to improved drinking water (%), 2002	82	90	UNICEF-WHO database
Urban	94	96	UNICEF-WHO database
Rural	60	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	80	76	UNICEF-WHO database
Urban	90	90	UNICEF-WHO database
Rural	62	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	24.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	2630	2000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	23,174	—	WDI database
Share of agriculture in GDP (%), 2004	12.6	13.6	WDI database
Share of industry in GDP (%), 2004	27.8	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	4.5	4.3	WDI database
Average annual growth of GDP per capita at constant prices	3.3	2.5	WDI database
Average annual growth of population	1.2	1.9	WDI database
Land and water resources			
Land area (million hectares)	16.4	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	207.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	3.1	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	1.5	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	4.2	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.4	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	4.6	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	3.6	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.5	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	174.1	133.0	FAO AQUASTAT
Dependency ratio (%)	8.7	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	2.2	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.4	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.1	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	2.6	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	3.9	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.3	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	4.1	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	2.9	4.8	FAO AQUASTAT

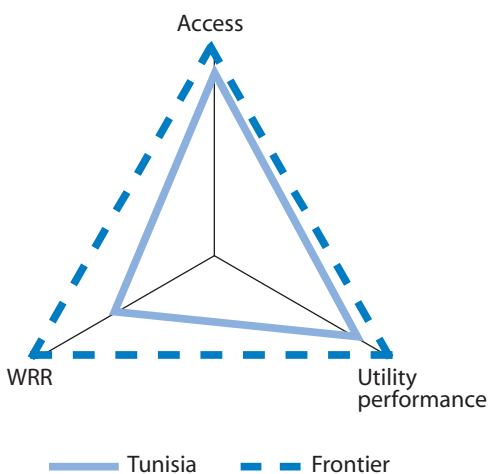
Tunisia (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	56.5	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	38	—	Chapagain and Hoekstra 2003
Water dependency (%)	62	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio	0.87	n.a.	World Bank 2005g
Nonrevenue water, all utilities	0.18	n.a.	IBNET database
Efficiency of water used in agriculture			
Water requirement ratio	0.54	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	2,405.7	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	1,078.8	701.0	FAO AQUASTAT
Percentage of cropped area irrigated (1999)	7.5	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	35.0	32.0	World Bank 2003a
Index of quality of administration	54.0	47.0	World Bank 2003a
Index of governance quality	43.0	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.14

Tunisia's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Tunisia	0.87	0.82	0.54

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

United Arab Emirates

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	4.3	294	WDI database
Urban population	3.7	172.5	WDI database
Rural population	0.6	121.5	WDI database
Population with access to improved drinking water (%), 2002	100	90	UNICEF-WHO database
Urban	100	96	UNICEF-WHO database
Rural	100	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	24	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	100	76	UNICEF-WHO database
Urban	100	90	UNICEF-WHO database
Rural	100	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2002	8.0	55.9	WHO-UNICEF
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	—	2,000	
GDP (million constant US\$ at 2000 prices), 2004	74,019	—	WDI database
Share of agriculture in GDP (%), 2004	—	13.6	WDI database
Share of industry in GDP (%), 2004	—	39.2	WDI database
Share of oil in GDP (%), 2003	67	—	WDI database
Average annual growth			
Average annual growth of GDP at constant prices	5.9	4.3	WDI database
Average annual growth of GDP per capita at constant prices	-1.4	2.5	WDI database
Average annual growth of population	7.2	1.9	WDI database
Land and water resources			
Land area (million hectares)	8.4	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	78.0	181.6	FAO AQUASTAT
Renewable water resources, 2002			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.2	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	0.1	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	0.2	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	0.2	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resource available (1,000 m ³)	0.1	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	6.5	133.0	FAO AQUASTAT
Dependency ratio (%)	0.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	1.6	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.5	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.2	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	2.3	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	1.7	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	2.5	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	4.2	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.6	4.8	FAO AQUASTAT

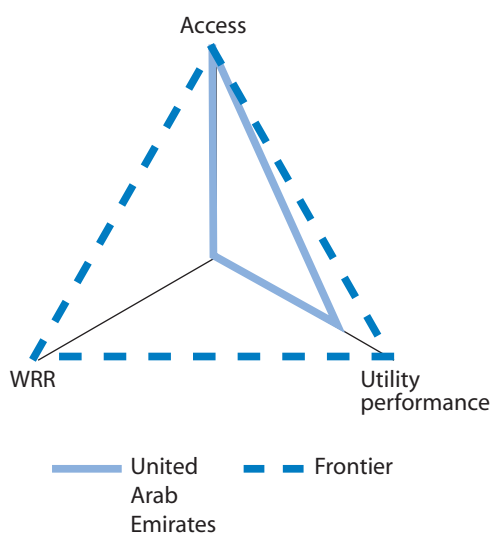
United Arab Emirates (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	1,488.2	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	35	—	Chapagain and Hoekstra 2003
Water dependency (%)	65	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio	0.11	n.a.	World Bank 2005I
Unaccounted for water	—	n.a.	
Efficiency of water used in agriculture			
Water requirement ratio	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	773.1	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	491.3	701.0	FAO, World Bank
Percentage of cropped area irrigated (1999)	56.7	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	34.0	32.0	World Bank 2003a
Index of quality of administration	73.6	47.0	World Bank 2003a
Index of governance quality	56.4	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.15

United Arab Emirates' Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
United Arab Emirates	1.00	0.70	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

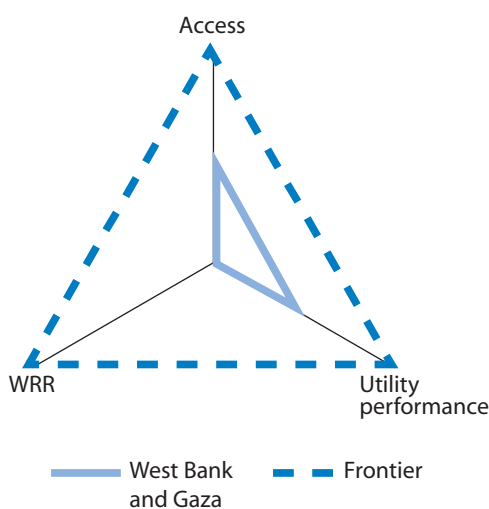
West Bank and Gaza

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	3.51	294	WDI database
Urban population	2.51	172.5	WDI database
Rural population	1.0	121.5	WDI database
Population with access to improved drinking water, 2002	75	90	USAID and PWA 2003
Urban	—	96	UNICEF-WHO database
Rural	—	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	6	—	Expert opinion
Percentage of population with access to improved sanitation , 2002	35	76	World Bank 2004j
Urban	—	90	UNICEF-WHO database
Rural	—	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births; 2002	114.0	55.9	World Bank 2004j
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2003	1,120	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2003	3,097	—	WDI database
Share of agriculture in GDP (%), 2003	6.2	13.6	World Bank 2004j
Share of industry in GDP (%), 2003	12.0	39.2	World Bank 2004j
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	-9.5	4.3	WDI database
Average annual growth of GDP per capita at constant prices	-10.0	2.5	WDI database
Average annual growth of population	4.3	1.9	WDI database
Land and water resources			
Land area (million hectares)	0.61	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	—	181.6	FAO AQUASTAT
Renewable water resources			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	0.072	153.1	http://www.ipcri.org/watconf/papers/yasser.pdf
Ground water (1,000 million m ³)	0.00	77.2	http://www.ipcri.org/watconf/papers/yasser.pdf
Total internal water resources (1,000 million m ³)	—	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	—	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	—	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resources available (1,000 m ³)	—	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	—	133.0	FAO AQUASTAT
Dependency ratio	—	—	
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	—	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	—	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	—	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	0.297	213.8	PWA; FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	—	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	—	14.4	Chapagain and Hoekstra 2003

West Bank and Gaza (continued)

Indicator	Country	MENA	Source
Total virtual water (1,000 million m ³)	2.2	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused), (1,000 million m ³)	0.032	4.8	http://www.ipcri.org/watconf/papers/yasser.pdf ; FAO AQUASTAT
Water scarcity (%)	—	—	
Water self-sufficiency (%)	—	—	
Water dependency (%)	—	—	
Public utility performance in major cities			
Operating cost coverage	—	n.a.	
Nonrevenue water, Gaza	0.66	n.a.	World Bank 2006b
Nonrevenue water, West Bank	0.4	n.a.	USAID and PWA 2003
Efficiency of water used in agriculture			
Water requirement ratio	—	—	
Agricultural value-added GDP (millions of current US\$), 2000	—	—	
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	—	701.0	WDI database; FAO AQUASTAT
Percentage of cropped area irrigated (1999)	—	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	—	32.0	World Bank 2003a
Index of quality of administration	—	47.0	World Bank 2003a
Index of governance quality	—	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.16**West Bank and Gaza's Position on Three Dimensions of Water Service**

	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
West Bank and Gaza	0.45	0.47	—

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Note: The value for WRR in the figure is set to 0 because the actual number is not available.

Yemen

Indicator	Country	MENA	Source
Socioeconomic indicators			
Total population (millions of people), 2004	19.8	294	WDI database
Urban population	5.1	172.5	WDI database
Rural population	14.6	121.5	WDI database
Population with access to improved drinking water (%), 2002	69	90	UNICEF-WHO database
Urban	74	96	UNICEF-WHO database
Rural	68	81	UNICEF-WHO database
Hours of access to tap water (hours/day)	2	—	Expert opinion
Percentage of population with access to improved sanitation, 2002	14	76	UNICEF-WHO database
Urban	76	90	UNICEF-WHO database
Rural	14	57	UNICEF-WHO database
Under 5 mortality, per 1,000 live births, 2003	113.0	55.9	WDI database
Macroeconomic indicators			
GNI per capita, Atlas method (current US\$), 2004	570	2,000	WDI database
GDP (million constant US\$ at 2000 prices), 2004	10,865	—	WDI database
Share of agriculture in GDP (%), 2004	14.9	13.6	WDI database
Share of industry in GDP (%), 2004	40.5	39.2	WDI database
Share of oil in GDP (%), 2003	—	—	
Average annual growth			
Average annual growth of GDP at constant prices	3.8	4.3	WDI database
Average annual growth of GDP per capita at constant prices	0.7	2.5	WDI database
Average annual growth of population	3.0	1.9	WDI database
Land and water resources			
Land area (million hectares)	52.8	948.9	FAO AQUASTAT
Average precipitation (mm/yr), 1998–2002	167.0	181.6	FAO AQUASTAT
Renewable water resources			
<i>Internal water resources</i>			
Surface water (1,000 million m ³)	4.0	153.1	FAO AQUASTAT
Ground water (1,000 million m ³)	1.5	77.2	FAO AQUASTAT
Total internal water resources (1,000 million m ³)	4.1	198.7	FAO AQUASTAT
Total external water resources (1,000 million m ³)	0.0	85.5	FAO AQUASTAT
Total renewable water resources (1,000 million m ³)	4.1	284.3	FAO AQUASTAT
Exploitable water resources (1,000 million m ³)	—	108.0	FAO AQUASTAT
Per capita renewable water resources available (1,000 m ³)	0.1	1.1	FAO AQUASTAT
Total renewable water resources as % of total water use	61.8	133.0	FAO AQUASTAT
Dependency ratio	0.0	—	FAO AQUASTAT
Water withdrawals, 2002			
Agricultural (1,000 million m ³)	6.3	188.3	FAO AQUASTAT
Domestic (1,000 million m ³)	0.3	17.5	FAO AQUASTAT
Industrial (1,000 million m ³)	0.0	7.9	FAO AQUASTAT
Total withdrawals (1,000 million m ³)	6.6	213.8	FAO AQUASTAT
Virtual water			
Virtual water imports in crops (1,000 million m ³)	1.4	57.8	Hoekstra and Hung 2002
Virtual water imports in livestock (1,000 million m ³)	0.2	14.4	Chapagain and Hoekstra 2003
Total virtual water (1,000 million m ³)	1.6	74.4	Hoekstra and Hung 2002; Chapagain and Hoekstra 2003
Supplemental (desalinated and retreated and reused)	—	4.8	FAO AQUASTAT

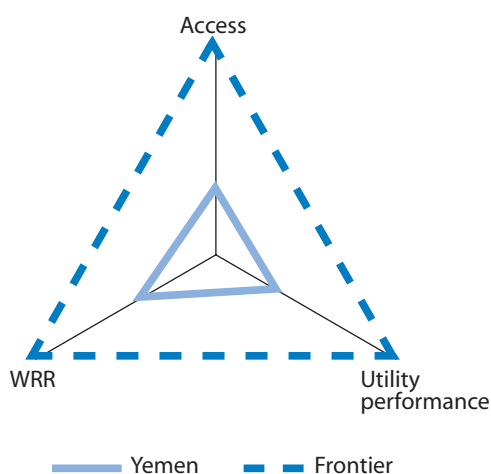
Yemen (continued)

Indicator	Country	MENA	Source
Water scarcity (%)	156.7	—	Chapagain and Hoekstra 2003
Water self-sufficiency (%)	80	—	Chapagain and Hoekstra 2003
Water dependency (%)	20	—	Chapagain and Hoekstra 2003
Public utility performance in major cities			
Operating cost coverage ratio, Sana'a	0.69	n.a.	Data provided by Yemeni water companies
Nonrevenue water, Sana'a	0.64	n.a.	IBNET database
Efficiency of water used in agriculture			
Water requirement ratio	0.40	—	FAO AQUASTAT
Agricultural value-added GDP (millions of current US\$), 2000	1,325.5	—	WDI database
Agricultural value-added GDP per cubic km of water used in agriculture (\$)	209.8	701.0	WDI database
Percentage of cropped area irrigated (1999)	29.4	45.7	WRI Earthtrends database
Governance indicators			
Index of public accountability	19.0	32.0	World Bank 2003a
Index of quality of administration	33.5	47.0	World Bank 2003a
Index of governance quality	22.5	37.0	World Bank 2003a

Note: — = Not available; n.a. = Not applicable.

FIGURE A3.17

Yemen's Position on Three Dimensions of Water Service



	Access	Public utility performance ^a	Water Requirement Ratio (WRR)
Frontier	1.00	1.00	1.00
Yemen	0.30	0.36	0.40

a. Public Utility performance is a ratio of water sold to net water supplied. It is 1-non-revenue water.

Definitions of indicators

Total population: Total of an economy includes all residents regardless of legal status or citizenship –except for refugees not permanently settled in the country of asylum who are generally considered part of the population of their country of origin.

Urban population: Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations.

Rural population: Rural population is calculated as the difference between total population and urban population.

Access to improved water: Access to improved water refers to the percentage of population with reasonable access to an adequate amount of water from an improved source such as household connection, public standpipe, borehole, protected well or spring or rainwater collection.

Access to improved sanitation facilities: Access to improved sanitation facilities refers to the percentage of population with access to at least excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta.

GNI Per capita Atlas method: GNI per capita is the gross national income divided by mid year population. GNI per capita in U.S. dollars is converted using World Bank Atlas Method.

GDP: GDP is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output.

Average annual growth: Growth rates are calculated as annual averages and represented as percentages. The average annual growth is computed as average of the annual growth rates for the last five years.

GDP per capita: GDP per capita is the GDP divided by the mid year population.

Under 5 Mortality rate: Under five mortality rate is the probability that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates.

Land area: Land area is the country's total area excluding area under in-

land water bodies, national claims to the continental shelf, and exclusive economic zones.

Average precipitation: Long-term double average over space and time of the precipitation falling on the country in a year, expressed in depth (mm/year).

Internal-Surface water: Surface water refers to long-term average annual volume of surface water generated by direct runoff from endogenous precipitation.

Internal-Groundwater: Groundwater refers to long-term annual average groundwater recharge, generated from precipitation within the boundaries of the country. Renewable groundwater resources of the country are computed either by estimating annual infiltration rate (in arid countries) or by computing river base flow (in humid countries).

Total internal renewable water resources: This is the long-term average annual flow of rivers and recharge of aquifers generated from endogenous precipitation. Double counting of surface water and groundwater resources is avoided by deducting the overlap from the sum of the surface water and groundwater resources.

External renewable water resources: This is the sum of the total natural external surface water resources and the external groundwater resources.

Total renewable water resources: This is the sum of internal renewable water resources and external actual renewable water resources, which take into consideration the quantity of flow reserved to upstream and downstream countries through formal or informal agreements or treaties and possible reduction of external flow due to upstream water abstraction. It corresponds to the maximum theoretical yearly amount of water actually available for a country at a given moment. While natural resources are considered stable over time, actual resources may vary with time and refer to a given period.

Total exploitable water resources: That part of the water resources which is considered to be available for development, taking into consideration factors such as: the economic and environmental feasibility of storing floodwater behind dams or extracting groundwater, the physical possibility of catching water which naturally flows out to the sea, and the minimum flow requirements for navigation, environmental services, aquatic life, etc. It is also called water development potential. Methods to assess

exploitable water resources vary from country to country depending on the country's situation. In general, exploitable water resources are significantly smaller than natural water resources.

Dependency ratio (%): That part of the total renewable water resources originating outside the country.

Agricultural water withdrawals: Gross amount of water extracted from any source either permanently or temporarily for agricultural use. It can be either diverted towards distribution networks or directly used. It includes consumptive use, conveyance losses and return flow.

Domestic water withdrawals: Gross amount of water extracted from any source either permanently or temporarily for domestic uses. It can be either diverted towards distribution networks or directly used. It includes consumptive use, conveyance losses and return flow.

Industrial water withdrawals: Gross amount of water extracted from any source either permanently or temporarily for industrial uses. It can be either diverted towards distribution networks or directly used. It includes consumptive use, conveyance losses and return flow.

Total water withdrawals: This is the sum of agricultural, industrial and other sectors and domestic water withdrawals less overlap if any.

Virtual water imports in crops: Virtual water imports in crops gives an indication of the quantity of water that could have been necessary for producing the same amount of food crops which is imported in a water scarce country.

Virtual water imports in livestock: Virtual water imports in livestock gives an indication of the quantity of water that could have been necessary for producing the same amount of livestock products which is imported in a water scarce country.

Total virtual water imports: Total virtual water imports gives an indication of the quantity of water that could have been necessary for producing the same amount of crops and livestock products which is imported in a water scarce country.

Supplemental (desalinated and reused): Freshwater produced by desalination of brackish water or saltwater and through reuse of urban or industrial wastewaters (with or without treatment).

Water scarcity (%): The ratio of total water use to water availability. Water scarcity will generally range between zero and a hundred per cent, but can in exceptional cases (e.g. groundwater mining) be above a hundred per cent.

Water self-sufficiency (%): Self-sufficiency is a hundred per cent if all water needed is available and indeed taken from within the national territory (when water dependency = 0). Water self-sufficiency approaches zero if a country relies heavily on virtual water imports.

Water dependency (%): This ratio measures the share of total renewable water resources originating outside the country. It is the ratio of the amount of water flowing-in from neighboring countries to the sum of total internal renewable water resources and the amount of water flowing in from neighboring countries expressed as percentage.

Operating cost coverage ratio: This is the ratio of operational revenues to operating costs for the water utility.

Nonrevenue water (%): Difference between water supplied and water sold (i.e. volume of water “lost”) expressed as a percentage of net water supplied.

Water requirement ratio: This is the ratio of the total irrigation water requirement for the country to the total agricultural water withdrawals for the country obtained from the country surveys. For a detailed description of the computation of this ratio by FAO refer http://www.fao.org/ag/agl/aglw/aquastat/water_use/index5.stm

Index of public accountability: This index measures four areas of accountability. First, level of openness of political institutions. Second, the extent to which free, fair and competitive political participation is exercised, civil liberties are assumed and respected, and press and voice free from control, violation, harassment and censorship. Third, the degree of transparency and responsiveness of the government to its people. Fourth, the degree of political accountability in the public sphere. For a detailed methodology of construction of this index refer to *World Bank 2003a*.

Index of quality of administration: This index measures the risk and level of corruption and black market activity, the degree and extent to which certain rules and rights are protected and enforced (such as property rights or business regulations and procedures), quality of budgetary

process and public management, efficiency of revenue mobilization, the overall quality of bureaucracy, and the independence of civil service from political pressure. For a detailed methodology of construction of this index refer to *World Bank 2003a*.

Index of governance quality: This is a composite index constructed using all the indicators for indices of public accountability and quality of administration. It thus assesses overall quality of governance giving equivalent weight to public accountability and quality of administration in the public sector. For a detailed methodology of construction of this index refer to *World Bank 2003a*.

APPENDIX 4

Case Studies: Mitigating Risks and Conflict

Name of system	Country or region	Characteristics of the system	
1. Saqya (water wheel)	Egypt, Arab Republic of (Nile Valley and Delta)	Saqyas (water wheels as lifting devices) lift water from tertiary canals to field ditches. Widely used in 1970s and early 1980s, less today.	
2. Informal water boards	Oases of Western Desert in Egypt	The board comprises the beneficiaries and together with the water point chairperson determines the groundwater selection point, allocation, and distribution of water shares (time shares) among beneficiaries. Cropping pattern planned by the Board before each growing season.	
3. Qanat (aqueduct) irrigation organizations	Iran, Islamic Republic of	This type of organization consisted of a head, a water boss, a well driller, and a watchman; the water distribution process was transparent to every shareholder who knew each other's shares. Under the supervision of the watchman, the farmer who irrigated opened the water way to his land while the others tightly closed their water ways until he finished.	
4. Jrida (irrigation schedule)	Bitit, Morocco, since 1930s	The Jrida establishes the full list of shareholders and their water rights together with the exact location of the fields they want to irrigate in the coming season.	
5. Conseil des Sages (Council of Notables)	Djibouti (rural village of Goubeto) until 1990s	Okal General (highest religious authority in the village) or community of elders.	

Status of person in charge of water distribution	Enabling environment	Conflict resolution mechanisms	Performance
<p>Saqya leaders (sheikhs) determine irrigation turns, settle disputes over irrigation turns, and collect money for maintenance of saqyas.</p>	<p>Strong social and kinship ties. System based on collective ownership. Farmers share O&M costs. System requires collaboration among farmers.</p>	<p>Sheikh as mediator. Customary councils or, in some rare cases, village mayor.</p>	<p>Conflicts are quickly solved and are usually nonviolent. Saqyas control the number of farmers who can irrigate at one point in time. Now farmers are using diesel pumps to get drainage water in times of water shortages.</p>
<p>Water point chairperson (who is normally the one holding the largest share or has much experience in the work).</p>	<p>Strong tribal values and rules.</p>	<p>Contract detailing distribution of water shares, roles, cost, selection of labor, and so on, is prepared for each family head. Periodic meetings of Board to assess and revise allocations. Participation of whole community in decision making. Transparent and fair system of allocation (tail users).</p>	<p>Limited conflicts because of strict rules of allocation, fair and participatory system, and elaborated irrigation and water management techniques.</p>
<p>The head, usually the person with the largest land and water shares, supervised activities of the other members, determined workloads and tariffs, and settled disputes among the shareholders. The water boss supervised water distribution among the shareholders.</p>	<p>Strong social ties and strict rules for allocation.</p>	<p>The members of the organizations were trusted persons in the community and were selected or elected by the shareholders. Transparent system of allocation.</p>	<p>The Qanat informal organizations proved a successful means of managing the irrigation process and preventing conflicts among the shareholders.</p>
<p>At the beginning of every agricultural season, all shareholders of a canal elect a certain number of canal riders to oversee water distribution along the canals, and agree on the <i>Jrida</i> and on the water distribution sequence during each irrigation turn.</p>	<p>Farmers have both land and water rights, which are independent from one another. Farmers can sell and buy water rights independently of land (water rights are expressed in hours of canal flow). Water allocation rules are very clear because they follow water rights.</p>	<p>Clear and transparent water distribution rules. Canal riders have the duties of overseeing exact implementation of irrigation schedule according to the <i>Jrida</i>, and dealing with disputes and water theft.</p>	<p>Water conflicts are minimal in Bitit. However, farmers sometimes steal water when they overestimate the area to be irrigated at the beginning of the growing season and find that their water share is not enough to cover crop water requirements during peak demand time. Tube wells presently provide a solution to this problem because farmers can buy tube well water on a volumetric basis to supplement their surface water shares.</p>
<p>The Conseil des Sages oversaw repairs of tampered water infrastructure and made decisions over water allocation.</p>	<p>Strong social and kinship ties.</p>	<p>The Council of Notables, headed by the Okal General, acts as mediator and uses customary laws to solve disputes.</p>	<p>Conflicts are frequent but are nonviolent and quickly solved. A water association was created in 2004 and progressively replaces the traditional structure of the Council of Notables; it includes broad representation of local stakeholders, including elders and delegates from youth and women's groups.</p>

(Continues on the following page)

Name of system	Country or region	Characteristics of the system	
<p>6. Council of Notables (the jama'a or mi'ad)</p>	<p>Jerid Oases of southwest Tunisia (Naftah and Tozeur), until 1912–13, that is, before direct control of the management of the oases by the central government and state authority over water.</p>	<p>The Council was mostly composed of the richest landowners and families of the oases, headed by a sheikh.</p>	
<p>7. Falaj or canal system</p>	<p>Oman <i>falaj</i> system started 2,000 years ago. It provides most of the small and large farms in northern Oman with water along with other villages' domestic needs.</p>	<p>The farming community owns and manages each <i>falaj</i> (canal), and the size of the <i>falaj</i> varies considerably. Smaller ones are owned by a single family whereas larger ones may have hundreds of owners. The government may have full or partial ownership in some cases. The owners distribute shares among themselves and retain some for community purposes, mosques, and for falaj maintenance. Domestic use is primary, agricultural use secondary, and the agricultural use strictly prioritized with permanent cultivation (date palms) getting priority over seasonal cultivation.</p>	
<p>8. Informal Tribal Councils</p>	<p>Highland water basins of the Republic of Yemen, that is, Wadi Zabid (Hodeidah governorate) and Wadi Tuban (Lahej governorate).</p>	<p>Generally, in spate irrigation areas, the traditional upstream first rule—<i>al'ala fa al'ala</i>—governs irrigation turns both between and within diversion structures and canal branches, by which upstream farmers have the right to a single full irrigation before their downstream neighbors can irrigate, and so on. This traditional system is still working today, but generates equity issues as it disadvantages the tail-enders.</p>	

Status of person in charge of water distribution	Enabling environment	Conflict resolution mechanisms	Performance
<p>The sheikh managed the water and assessed and collected the taxes owed to the Bey of Tunis. The Council was assisted by the water manager in chief who was responsible for the distribution of water throughout the oasis, and the amin al-shuraka who was in charge of sharecroppers. Each <i>falaj</i> has a “director” or <i>wakil</i> chosen by the <i>falaj</i> owners as someone respected, honest, and having at least basic education. The <i>wakil</i> is in charge of water distribution, water rent, expenditure of <i>falaj</i> budget, solving water disputes between farmers, emergencies, and other activities.</p> <p>Water shares are distributed on a time basis. The length of the time share is inversely proportional to the flow rate and number of <i>falaj</i> owners and is directly proportional to the contribution of the owner in constructing the <i>falaj</i>.</p> <p>The traditional irrigation system is supervised by 30 Shaykhs appointed by the Tuban District Irrigation Council and paid by farmers at harvest time. The channel master or <i>Shaykh al Sharej</i> supervises water distribution among farmers for each command area. The position of the <i>Shaykh al Sharej</i> remains always inside the same family, inherited from father to son. He is highly respected, trustworthy, experienced, and knowledgeable of the flood seasons and well paid (5% of the farmer’s</p>	<p>Very hierarchical and oligarchic society (divided between the workers, the shuraka or kham-masa, and the landowners). Strict private ownership of water (until the domanialization decree of 1885 which introduced public ownership of water).</p> <p>Falaj maintenance was the responsibility of every individual in the society. The social structure that has grown up in each settlement was based on the need to cooperate and organize the water supply, and fund regular, sporadic, and urgent falaj maintenance.</p> <p>Tribal conventions, customs established over centuries (Al-Garaty code) are used to resolve conflict.</p>	<p>Strong power and organization enabled the Council members to ensure and watch over distribution of water. Strict control and upkeep of irrigation network. Permanent specialized force in place in charge of the upkeep of the drainage network (corvée labor).</p> <p>The <i>wakil</i> is the first level of conflict resolution, then the local sheikh. If he cannot solve the matter, it may be raised to the governor (<i>wali</i>) or even a court.</p> <p>Cooperation between the families concerned is essential for management of spate flows and the spate structures and systems. Despite the importance of cooperation, conflicts occur frequently because water is scarce and everyone tries to get the most they can.</p>	<p>n.a.</p> <p>The <i>falaj</i> will remain the main irrigation water source despite the fluctuation in rainfall. Several challenges have threatened the existence of this inherited system, such as easier-to-manage modern electric water pumps and irrigation systems; loss of traditional way of irrigation scheduling; and reduction and salinity of <i>falaj</i> water due to the ecological deterioration of its surroundings. More recently, dug wells are being used to supplement the <i>falaj</i> water.</p> <p>The construction of permanent diversion weirs along the wadis, in addition to the traditional earthen diversion bunds (<i>oqmas</i>), and the rapid increase in wells for irrigation have resulted in reductions in the spate flows reaching the tail-ends of the wadis. Farmers at the tail-ends believe that upstream farmers are taking more water than before, thanks to improved concrete diversion structures and to the up-streamers’ influence over the management agencies. Recently, there have been some efforts to rehabilitate the irrigation structures and establish formal</p>

(Continues on the following page)

Name of system	Country or region	Characteristics of the system	

Sources: Bahamish 2004; CEDARE, 2006; CENESTA n.d.; Wolf 2002.

Note: n.a. = Not applicable.

	Status of person in charge of water distribution	Enabling environment	Conflict resolution mechanisms	Performance
	<p>crop). He safeguards the full share of water from the channels under his control; apportions water fairly between secondary channels according to the customarily agreed allocation of water; settles water disputes between farmers in the channels under his control. He gathers and organizes farmers to build earth dikes and calculates the costs and charges for each farmer proportionally to his irrigated area and finally collects fees.</p>			<p>Water User Associations as a modern and more organized method for water management in Wadi Tuban.</p>

