



# SHARED WATER RESOURCES MANAGEMENT



*Shared water resource management poses an important challenge for Arab countries since most water resources are shared either by countries of the region or with non-Arab neighbouring countries.*

Shared water resources include rivers, aquifers, intermittent streams and coastal resources that cross international borders. The majority of the region's surface water comes from seven major rivers, among which are the Nile, the Tigris and the Euphrates that have their origins based outside the region. The region also has several shared aquifers, among which are the Jabal Al Arab (Basalt) aquifer, the Rub Al Khali (Paleocene) aquifer, the Disi aquifer and the Nubian Sandstone aquifer.

Selected shared water resources in the Arab Region			
Water resources	Shared countries	Dimensions	
		Length	Catchment area
Nile River	Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Eritrea, Kenya, Rwanda, Sudan, Tanzania and Uganda	6,695 km	3.1 million km <sup>2</sup>
Euphrates River	Iraq, Syria and Turkey	2,780 km	233,000 km <sup>2</sup>
Tigris River	Iran, Iraq, Syria and Turkey	1,850 km	190,800 km <sup>2</sup>
Jordan River	Jordan, Lebanon, Palestine and Syria	251 km	183,000 km <sup>2</sup>
Al-Assi River	Lebanon, Syria and Turkey	248 km	36,000 km <sup>2</sup>
Nubian Sandstone	Chad, Egypt, Libya and Sudan		2.17 million km <sup>2</sup>
Arabian Peninsula Aquifers	Bahrain, Jordan, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen		1.2 million km <sup>2</sup>
Eastern Shield Aquifer	Algeria and Tunisia		400,000 km <sup>2</sup>
Disi Aquifer	Jordan and Saudi Arabia		106,000 km <sup>2</sup>
Eastern Mediterranean Carbonate Aquifer	Jordan, Lebanon, Palestine and Syria		48,000 km <sup>2</sup>

## International agreements to enhance the management of shared water resources include:

- The Convention on the Law of the Non-Navigational Uses of International Watercourses, adopted by the United Nations General Assembly in May 1997 (but not yet in force), and
- The Law of Transboundary Aquifers, which is presented for consideration by Member States in United Nations General Assembly Resolution A/RES/63/124 of 15 January 2009.

These international legal frameworks provide a platform for managing shared surface and groundwater resources based on international water law principles. These principles call for:

- The equitable and reasonable utilization of water resources;
- The obligation to cooperate and not to cause harm;
- Cooperation among all riparian countries;
- The exchange of data and information; and
- The prevention of conflict arising over shared water resources.

Countries are also encouraged to develop appropriate legally binding frameworks on shared waters in order to enhance the management of shared water resources.

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# ESCWA WATER FACT SHEET

## SHARED WATER RESOURCES MANAGEMENT

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# WATER & CLIMATE CHANGE



Climate change impacts on water resources is a key challenge facing the Arab Region that affects the availability of water resources as well as the operation and maintenance of existing water infrastructure. Current management practices and investment levels are not sufficiently robust to mitigate risks and cope with expected impacts.

## Expected impacts include:

- Increases in temperature and aridity;
- Higher evaporation-transpiration rates;
- Lower soil humidity;
- Shifts in precipitation patterns in terms of temporal and geographic distribution;
- Greater annual and seasonal climate variability;
- Increased number of extreme weather events, including downpours and flash floods;
- Lower duration of droughts matched by increased land degradation and desertification;
- Less snow cover and associated snow melt at high altitudes;
- Rise in sea-levels affecting near-shore installations, coastline developments and coastal aquifers; and
- Reduced water quality due to increased pollution concentrations and seawater intrusion.

*These impacts will undoubtedly effect the socio-economic development and environmental sustainability of the region. The consequences will be far reaching and will most affect vulnerable groups such as women, the elderly, children, the poor and the disadvantaged.*

Adaptation of the water sector to climate change can be defined as actions societies take in response to, or in anticipation of, projected or actual climate change as a mean to reduce adverse impacts.

Vulnerability assessments can assist in the identification of socio-economic and environmental risks and stresses and assist policy-makers to target interventions in priority areas of concern.

Examples of adaptation of the water sector to climate change		
Area of vulnerability	Adaptation on the supply side	Adaptation on the demand side
Municipal water supplies	<ul style="list-style-type: none"><li>• Increase reservoir capacity</li><li>• Desalinate</li><li>• Inter-basin transfer</li><li>• Rain harvest</li></ul>	<ul style="list-style-type: none"><li>• Use Grey water</li><li>• Improve water use efficiency</li><li>• Reduce leakages</li><li>• Use economic instruments</li><li>• Enforce water legislations</li></ul>
Water quality	<ul style="list-style-type: none"><li>• Enhance treatment works</li><li>• Reuse and reclaim</li><li>• Upgrade water protection</li></ul>	<ul style="list-style-type: none"><li>• Reduce effluent volume of waste</li><li>• Promote alternatives to chemicals</li></ul>
Rain fed agriculture	<ul style="list-style-type: none"><li>• Improve soil conservation</li><li>• Supplement from other sources</li><li>• Develop bio-saline technology</li></ul>	<ul style="list-style-type: none"><li>• Use drought tolerant crops</li></ul>
Irrigated agriculture	<ul style="list-style-type: none"><li>• Improve tilling practices</li><li>• Harvest rainwater</li><li>• Reuse treated domestic wastewater</li></ul>	<ul style="list-style-type: none"><li>• Increase irrigation efficiency</li><li>• Empower water users associations</li><li>• Activate economic instruments</li></ul>
Water storage infrastructure	<ul style="list-style-type: none"><li>• Build reservoirs and levees</li><li>• Protect and restore wetlands</li></ul>	<ul style="list-style-type: none"><li>• Flood early warnings systems and emergency response planning</li><li>• Reduce floodplain development</li></ul>

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## WATER AND CLIMATE CHANGE

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# WATER & DISASTERS



Water and climate-related extreme events are a major cause of natural disasters. About 90% of disaster events are caused by water/climate-related hazards, such as floods, droughts and landslides. As climate change increases, the frequency and intensity of extreme weather, the number of water-related disasters, is expected to rise.

## Short-term disasters:

- ▶ Results from excessive and intensive rainfall over short periods of time that cause flash events, such as flooding, rock falls and landslides.
- ▶ Recent flood events in the Arab Region occurred in Egypt (2010) where seven people died; in Yemen (October 2008) where about 100 people lost their lives; in Oman (August 2007) where Cyclone Gono killed about 50 people; in Algeria (November 2001) where about 1000 persons died; and again in Algeria in 2008 where an additional 31 people lost their lives.

## Long-term disasters:

- ▶ Caused by drought associated with long-term water scarcity. It is a creeping event which can last for several years such as those that affected countries of North Africa in the early 1980s and early 1990s and most of the Arab region from 1998 to 2000.

Natural disasters are exacerbated by inadequate planning, preparation, management and response. To adapt to and mitigate the impact of natural disasters, countries are developing strategies, preparedness plans and forecasting tools. Core elements include risk identification and assessment, forecasting, preparedness, emergency response and recovery.

*In January 2010, heavy rains and flash flooding in the Sinai Peninsula killed over a dozen people in Egypt. The storm also destroyed homes, washed away roads and bridges, took down electricity towers, closed five shipping ports and damaged the Sharm El-Sheikh Airport. The flash floods were among the worst experienced in the area since 1994.*

*A newly established Early Warning System, which had come on-line just one month prior to the storm, predicted extreme flooding in certain areas two days prior to the event. This allowed authorities to take appropriate actions on a pilot basis in Nuweiba City near Wadi Watier and the Gulf of Aqaba. As a result no casualties were reported in that area.*

*The Early Warning System includes a computer-based Flash Flood Management (FlaFlom) tool operated by the Water Resources Research Institute of the Egyptian Ministry of Irrigation and Water that allowed officials to forecast the amount, timing and location of rainfall and associated risks based on hydrological modeling and simulations of potential flash flood events. An early warning notice was then sent to the Egyptian Crisis and Disaster Management Centre for response.*

## Disaster prevention and preparedness measures include:

- Building early warning systems and monitoring networks at local and regional levels;
- Preparing strategies and management approaches for implementation in case of any disaster;
- Institutionalizing cooperation and coordination mechanisms at different levels in order to mitigate or reduce the impact of disasters;
- Formulating emergency-response measures including medical, rescue and temporary housing options;
- Building disaster-proof infrastructure such as retaining walls, water channels and dams.

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## WATER AND DISASTERS

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# WATER & FOOD SECURITY



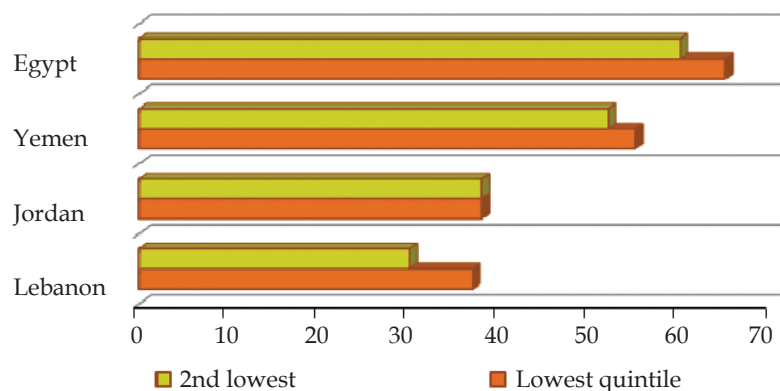
Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. (World Food Summit Plan of Action) A country can meet its basic food needs through local production or imports. As such, countries do not have to focus on food self-sufficiency to achieve food security when engaged in trade. The separation of food security from domestic agricultural production and agricultural water consumption also allows the policy space necessary to promote sustainable rural livelihoods through diversified rural development strategies.

The recent food crisis was triggered by a rapid rise in the price of basic food commodities and fuel. Food insecurity was felt in the Arab Region due to the heavy reliance on increasingly costly food imports, growing demand, and the inability to stabilize domestic prices through increased local agricultural production, given the land and water resource constraints that characterize the region.

- **Jordan and Lebanon** are heavily dependent on food and fuel imports;
- **Palestine, Iraq and Yemen** are particularly vulnerable to food price fluctuations given their relatively high poverty rates, uncertain security consideration, and dependence on imports;
- **Egypt, Morocco and Syria**, despite their large agricultural sectors, are faced with water resource constraints and land degradation in rural areas and increasing migration to urban centers, which is increasing food insecurity for vulnerable groups.

Arab countries demonstrated their commitment to address the food crisis collectively when they issued the **Riyadh Declaration on Promoting Arab Cooperation to Face the Global Food Crisis** in April 2008. The Declaration calls for sound trade and investment schemes for enhanced food security in the short and long terms, and promotes the expansion of public-private partnerships and inter-Arab agricultural trade.

## Share of the poor's expenditure on food



Source: World Bank Household Surveys (2006-2008)

## Food security through South-South Partnerships

- Several members of the Gulf Cooperation Council have forged partnerships and agricultural investments in other Arab countries and developing regions to grow staple agricultural commodities. Jordan and Lebanon are seeking cooperation with Sudan in the agricultural sector;
- Partnerships are being pursued through sovereign wealth funds, State owned enterprises, privately owned agro-food consortiums, and bilateral negotiations.

## Other options to reduce food insecurity among vulnerable populations include:

- Improving national food early warning systems and drought early warning systems;
- Increasing the storage capacity of strategic food reserves;
- Adopting proactive policies to support more efficient agricultural water use;
- Providing social safety nets and diversifying income sources in rural areas and among the urban poor.

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## WATER AND FOOD SECURITY

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# WATER & SANITATION

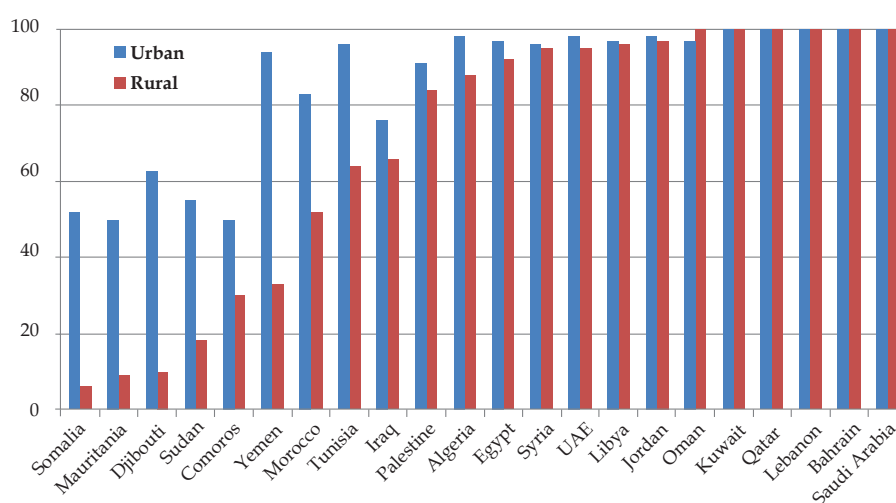


Sanitation in the Arab region is a major challenge given the rapid growth in economic and social development. Investments in sanitation, wastewater treatment and waste management have generally not been as important as those for water supply. About 84 per cent of the urban population of the region has access to improved sanitation compared to 56 per cent in rural areas where access ranges from 18 per cent in the poorest countries to 98 per cent in the richest ones.

## "Improved sanitation facility" refers to:

- facilities connected to a public sewer or a septic system,
- pour-flush latrines,
- simple pit or ventilated improved latrines provided that they are not public or shared.

## Percentage of rural and urban population with access to an improved sanitation facility (2008)



Sanitation provision can be expensive, but offers an opportunity to augment water supply through the recycling and re-use of wastewater. The lack of sanitation facilities is often associated with unsafe drinking water and remains one of the principal causes of debilitating diseases, especially in rural areas.

	Total number of people requiring access to sanitation by 2025 (<000)	Sanitation investment needs (2000-2025) (US\$ million)
Bahrain	247	33.8
Egypt	28,251	3,862.4
Iraq	22,171	3,031.1
Jordan	3,802	519.8
Kuwait*	1,343	183.7
Lebanon	1,119	153.0
Oman	3,076	420.6
Palestine	3,954	540.6
Qatar	206	28.2
Saudi Arabia	20,127	2,751.7
Syria	12,841	1,755.6
UAE	940	128.5
Yemen	41,233	5,637.4
Total	139,310	19,046.3

ESCWA is mandated by the League of Arab States and the Arab Ministerial Water Council to establish a regional mechanism for monitoring water supply and sanitation based on region-specific indicators. These indicators will build upon the United Nations Millennium Development Goal (MDG) targets on water supply and sanitation by reporting on access to water supply and sanitation sources as well as the quality of services provided. Work is being conducted in collaboration with Arab Member States, ACWUA, RAED, AWC, CEDARE and the WHO.

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# WATER DEMAND IN THE ARAB REGION



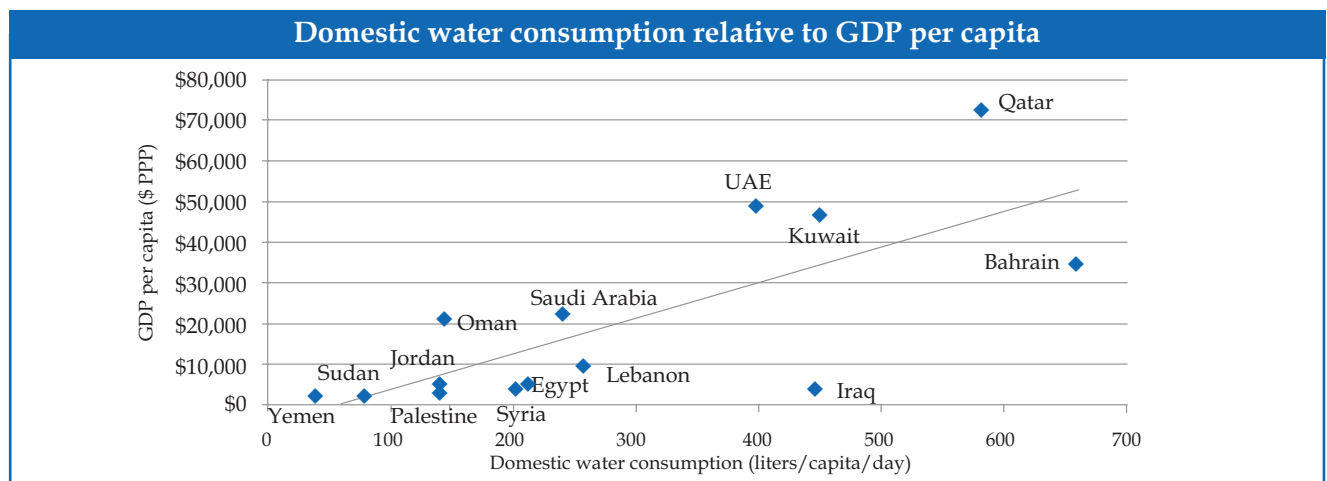
*In recent years, Arab countries have sought to revisit their water consumption patterns due to increasing water demand and scarcity. Water demand can be broken up into three types – agriculture, domestic and industry, with the service sector being counted in the latter two.*

## Agricultural water demand:

- Accounts for more than 80 per cent of freshwater consumption in the region;
- The annual amount of water used in agriculture is expected to increase by 40 per cent from current levels by 2020;
- Higher income Arab countries are finding it easier and more cost effective to import food or invest in producing it abroad for import than to grow water-hungry crops at home;
- Population pressures and the need to promote rural development through agriculture-based strategies have maintained the agricultural sector as a core component of socio-economic development in most countries in the region.

## Domestic water demand:

- As illustrated in the chart below, higher living standards are associated with higher water consumption levels in the Arab region;
- With a population growth estimated at more than 2 per cent and urbanization increasing, policy-makers need to revisit water allocation decisions based on national welfare costs and benefits;
- Understanding domestic water use and consumption trends are necessary for effective and efficient application of water demand management tools and prediction of future demand.



## Industrial water demand:

- Water is mostly used in the industrial sector for cooling purposes, representing one-fourth to one-half of the total volume of water used in industry;
- The water quality required by industry varies by product type of production process;
- The services sector is often accounted for in various statistical databases under domestic or industrial demand, despite its importance for policy-making as a stand-alone sector. The key service industries that are imposing new demands on limited freshwater resources related to tourism, recreational activities, and real estate development.

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## WATER DEMAND IN THE ARAB REGION

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# WATER QUALITY & HEALTH



*Water demand is at unprecedented levels in the Arab region and many countries are already listed as among the poorest in freshwater resources in the world. The increased demand for water and its over-abstraction is compounding water quality problems and raising serious concerns about health-related issues.*

## The deterioration of water quality is a result of the following factors:

- Increased discharge of untreated and minimally treated domestic water;
- Discharge of hazardous and toxic industrial wastewater from agro-food, textile and other plants;
- Run-off and drainage of excess agricultural water containing agricultural chemicals (fertilizers, pesticides and salts from irrigation systems);
- Over-exploitation of groundwater resulting in falling water tables and leading to seawater intrusion in coastal aquifers;
- Conflicts, wars and natural disasters leading to the physical damage of water supply and sanitation infrastructure;
- Oil spills due to the destruction and damage of oil fields, reservoirs and pipelines resulting in groundwater pollution and the degradation of the marine environment.

Country	Waterborne diseases and health challenges (2008)
Egypt	The cost of diseases and death caused by water pollution is estimated at US\$800 million/year
Iraq	While most waterborne diseases are under control, dysentery and hepatitis are spreading in rural areas. Cholera has emerged as a problem in northern Iraq
Lebanon	Waterborne diseases affect 45/100,000 inhabitants/year
Palestine	Waterborne disease outbreaks are not well monitored; minor cases are registered in the West Bank. In the Gaza Strip, Blue Baby Syndrome is registered. Only 5% of the available water in the Gaza Strip are within WHO standards for drinking water
Oman	8.3% of drinking water samples failed to comply with chemical quality standards. 26.8% of drinking water samples failed to comply with bacteriological quality standards

Governments have taken measures to protect their water resources and reduce water pollution through various strategies, policies and regulations. There will be a need to create an enabling environment, to setup an appropriate institutional framework and to ensure a good planning and to demonstrate good planning and prioritization capabilities.

## Guiding principles should include:

- Preventing water quality deterioration rather than treating the symptoms;
- Applying realistic standards and regulations;
- Balancing economic and regulatory instruments to control water quality;
- Enforcing water quality requirements starting at community level;
- Establishing mechanisms for inter-sectoral integration;
- Encouraging a participatory approach by including all relevant stakeholders;
- Disseminating widely available information on water quality and health; and
- Promoting international cooperation on water quality control.



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## WATER QUALITY AND HEALTH

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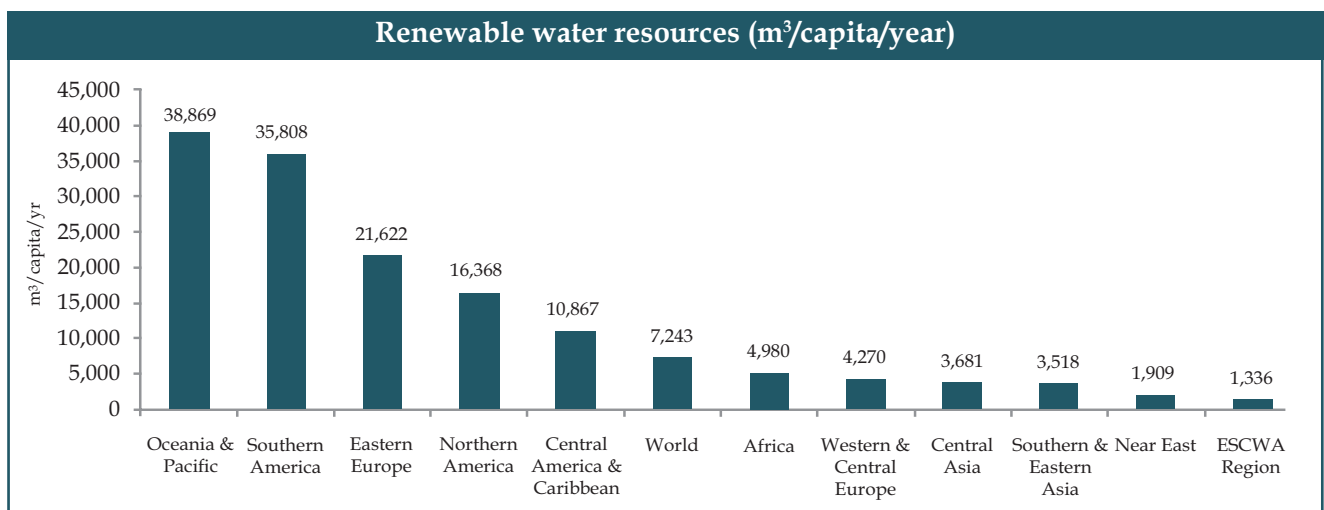
# WATER RESOURCES IN THE ARAB REGION



*The availability of water resources is affected by growing water demand and the deterioration of surface and groundwater quality. In order to overcome the current water deficit, Arab countries are managing their existing water resources more efficiently and are attempting to increase their supply of freshwater through the development of conventional and non-conventional water resources.*

## Conventional water resources

- Conventional water supplies consist of fresh surface water and groundwater resources;
- The Arab region has the lowest per capita renewable freshwater supply in the world;
- The average per capita share of renewable freshwater in the region is just slightly higher than the internationally accepted water poverty/scarcity threshold of 1,000 m<sup>3</sup>/capita/year.



## Non-conventional water resources

### 1- Reuse of treated wastewater, drainage water and grey water:

- Treated water is used for crop production, irrigation of green spaces and golf courses, groundwater recharge and industrial cooling;
- The adoption and enforcement of strict quality standards is essential.

### 2- Reuse of agricultural runoff:

- Runoff is collected and drained into other surface water bodies in order to augment supply;
- If not well implemented, the practice can increase salt and pesticide concentrations downstream.

### 3- Desalination:

- Satisfies a significant portion of the water supply shortfall in Arab countries, particularly in the Gulf countries which produce about half the world's desalinated water;
- Other Arab countries are starting to incorporate water desalination into their national development strategies and water master plans as a means to augment water supply;
- Some adverse environmental impacts are associated with desalination, including discharge of hot and concentrated brine into coastal marine environments and inland water bodies, the entrapment of aquatic creatures in plants intakes, and the production of carbon dioxide (CO<sub>2</sub>) due to the production and transfer of desalinated water to end users.

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# WATER SUPPLY



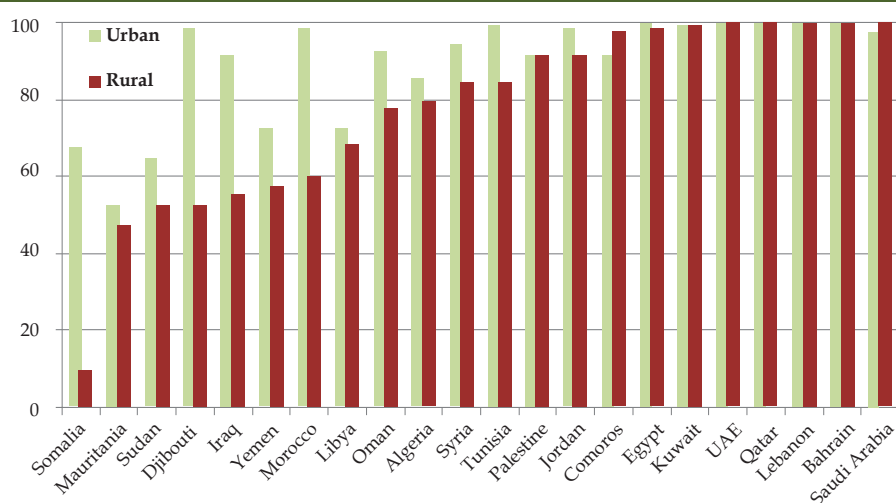
Arab countries have high levels of access to improved water supply, although large disparities exist between urban and rural areas. About 91 per cent of the population in urban areas has access to drinking water sources compared to about 75 per cent in rural areas where access ranges from 10 per cent in the least developed countries of the region to 100 per cent in the more developed ones.

## “Improved water supply”

refers to drinking water supplied from any of the following source:

- Piped water into dwelling, yard or plot;
- Public tap or standpipe;
- Tube well or borehole;
- Protected dug well;
- Protected spring;
- Rainwater collection.

## Percentage of population with access to improved water supply (2008)



Although most Arab countries are on track to meet the Millennium Development Goal target seeking increased access to improved drinking water sources, sustaining the progress achieved will prove a challenge as more than half of the countries in the region are overusing their renewable water resources. As an emerging trend, many Arab countries have also witnessed an explosion in the consumption of bottled water, which is perceived to be of better quality, more reliable and convenient.

The increased awareness of the growing water supply problem is reflected in the formulation of national development plans and water sector strategies that aim to respond to existing water challenges.

## The general objectives of these policies:

- Improve water use efficiency by introducing new technical and institutional measures;
- Improve water allocation efficiency by enhancing productivity and maximizing benefits and formulating special economic measures;
- Reduce water deterioration in quantity and quality through efficient legislation, regulation, monitoring, enforcement, and economic measures; and
- Curb growing water demand levels through regulatory, technical and economic instruments.

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# ESCWA WATER FACT SHEET

## WATER SUPPLY

### *Sources*

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