Chapter 2

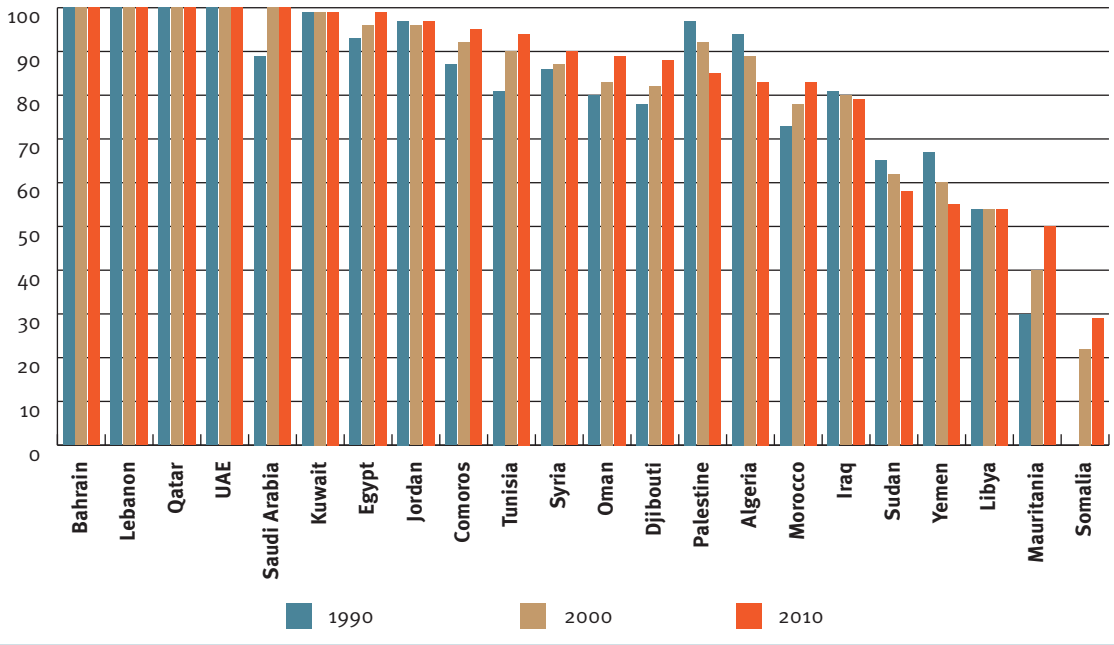
Challenges to water governance in the Arab region

This chapter addresses major water governance challenges in the Arab region. It emphasizes policy choices and relevant interests, laying a foundation for an effective water governance system.

Water coverage and distribution

Despite conditions of water scarcity and a dramatic shrinkage in per capita renewable water resources in recent decades, many Arab countries have made progress in providing improved water and sanitation to their populations. About 82 per cent of people in the region have access to improved drinking water (Figure 2.1) and about 76 per cent to improved

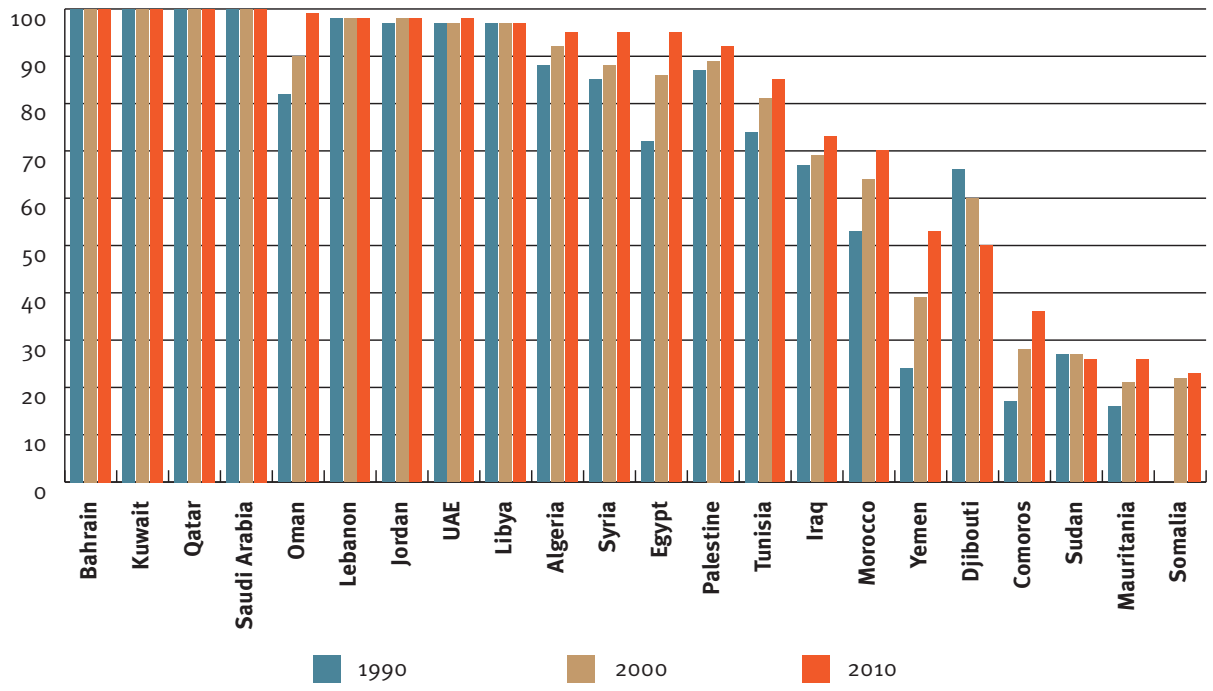
Figure 2.1 Trends in population with access to improved drinking water sources in Arab countries, 1990, 2000 and 2010



Note: Somalia has insufficient data for 1990.

Source: WHO and UNICEF 2013.

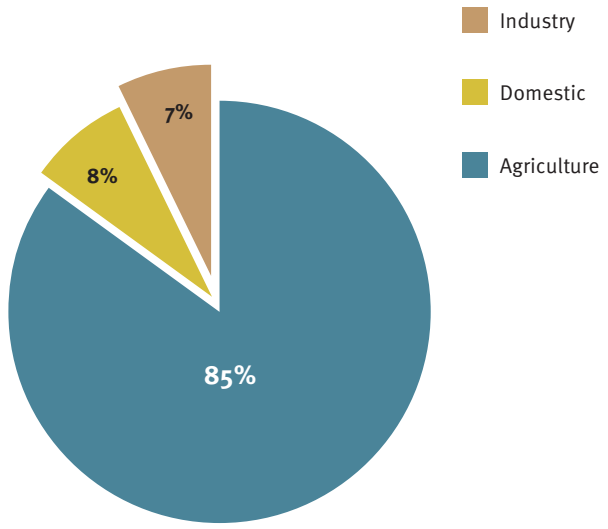
Figure 2.2 Trends in population with access to improved sanitation in Arab countries, 1990, 2000 and 2010



Note: Somalia has insufficient data for 1990.

Source: WHO and UNICEF 2013.

Figure 2.3 Water uses in the Arab region



Source: World Bank n.d.

sanitation (Figure 2.2).[1] But supplying water to growing populations is becoming increasingly challenging. Shrinking water availability, with demand outpacing supply, is triggering competition among water use sectors: industrial, agricultural and municipal. Water managers have responded by providing a little water for all and a little more for some, depending on government priorities. Macroeconomic arguments are being made for reallocating water supplies from one sector to another, to boost economic development. Such decisions have extensive political and social ramifications, especially when strong advocacy groups represent water use sectors.[2] Each sector has its own arguments for why it needs and deserves more water. Agriculture currently dominates water use in the Arab region (Figure 2.3).

Agriculture sector

Although urban demand for water has been rising steadily, agriculture continues to consume the most water. Agricultural water use rose

Box 2.1 Agricultural expansion based on fossil groundwater resources

In the Gulf Cooperation Council countries, trade protection, price supports, lack of restrictions on groundwater extraction, and agricultural subsidies for wells, fuel and other inputs have contributed to large expansions of irrigated land and depletion of aquifers. Over the last two decades, irrigated areas in Gulf countries grew 100-300 per cent. Irrigation water is often used inefficiently, without considering the economic opportunity cost for urban domestic and industrial purposes. Although agriculture contributes less than 2 per cent of GDP in Gulf countries, it receives a disproportionate share of water (85 per cent of total withdrawals from natural water resources) and overexploits groundwater (mostly non-renewable fossil groundwater) resources. Aquifers are being depleted, and water quality is deteriorating as seawater infiltrates the aquifers. Countries have no clear exit strategy for how to replace these resources once they are exhausted.

In Saudi Arabia, generous subsidies have encouraged the rapid expansion of irrigated areas, nearly tripling agricultural water use. Water use rose from about 7.4 billion cubic metres a year in 1980 to a high of 20.2 billion in 1994, before falling to 18.3 billion in 2000, and now stands at 17.5 billion. By 1995, about 35 per cent of non-renewable groundwater reserves in Saudi Arabia were already depleted. This use of groundwater for irrigation is unsustainable; water levels have dropped more than 200 metres in some aquifers over the last two decades. Since 2000, the Saudi government has taken steps to reduce groundwater depletion by encouraging efficient irrigation water use and reducing fiscal burdens by ending land distribution and reducing input subsidies. It has also introduced incentives to use water-saving technologies such as drip irrigation and soil moisture sensing. These policies have had a considerable effect on irrigation water demand.

Recently the Saudi government introduced a sustainable agricultural strategy to cut water consumption in half. The plan calls for an end to planting green fodder for livestock feed and for reducing wheat production by 12.5 per cent year by discontinuing a 30-year-old wheat plantation project that had achieved total wheat self-sufficiency but at a cost of draining the country's groundwater resources. Under the new plan, government subsidies will support only the least water-consuming crops. Green fodder imports will offset the drop in local production. The five-year sustainable agriculture plan also calls for developing the distribution chain and promoting organic crop agriculture. A new Saudi drive focuses on agricultural investment in countries such as Egypt, Ethiopia, India, Indonesia, Pakistan, the Philippines, Sudan, Thailand, Turkey and Ukraine, to replace local production. Following negotiations with the Saudi Ministry of Trade and Industry, the Philippines agreed to allocate an area of 100,000 hectares in Mindanao Island to cultivate rice and other grains for export to Saudi Arabia.

Source: LAS, UNEP, and CEDARE 2010; Al-Zubari 2008; Al-Turbak 2002; World Bank 2005; El-Ashry, Saab, and Zeitoon 2010; Sadik 2013.

from about 160 billion cubic metres in 1995 to more than 200 billion in 2003.[3] But despite the increase, agricultural performance and food production failed to advance in many Arab countries.[4]

Over the last three decades, the Arab region has experienced a development boom, with rapid population growth. To meet the accompanying rising demand for food, many countries have prioritized food security and socio-economic development through policies to expand agricultural land and irrigated cultivation. But they have failed to consider water's limited availability and the need for conservation and demand management (Box 2.1).[5]

Water scarcity has become a critical constraint to agriculture. About half of irrigation water is wasted because of inefficient methods, such as deep percolation evaporation and surface run-off use (Figure 2.4).[6] Surface irrigation, practiced on 80 per cent of the irrigated area, is the most widely used method in the region, followed by sprinkler irrigation, which is practiced on 23 per cent of the area. The more efficient micro-irrigation is practiced on only 2.8 per cent of irrigated area.[7] Some studies estimate that irrigation efficiencies in the Arab region are as low as 30-40 per cent.[8] Such waste leads to weak agricultural performance and, more dangerously, salinization and water-level decline due to overuse. In many countries, food self-sufficiency is declining as land and water resources are depleted and population grows. Agricultural practices are also contributing to increased soil and water salinity, toxic pollution from agrochemicals, loss of biodiversity through wetlands destruction and the construction of new dams.[9]

The International Fund for Agricultural Development identified four major pressures

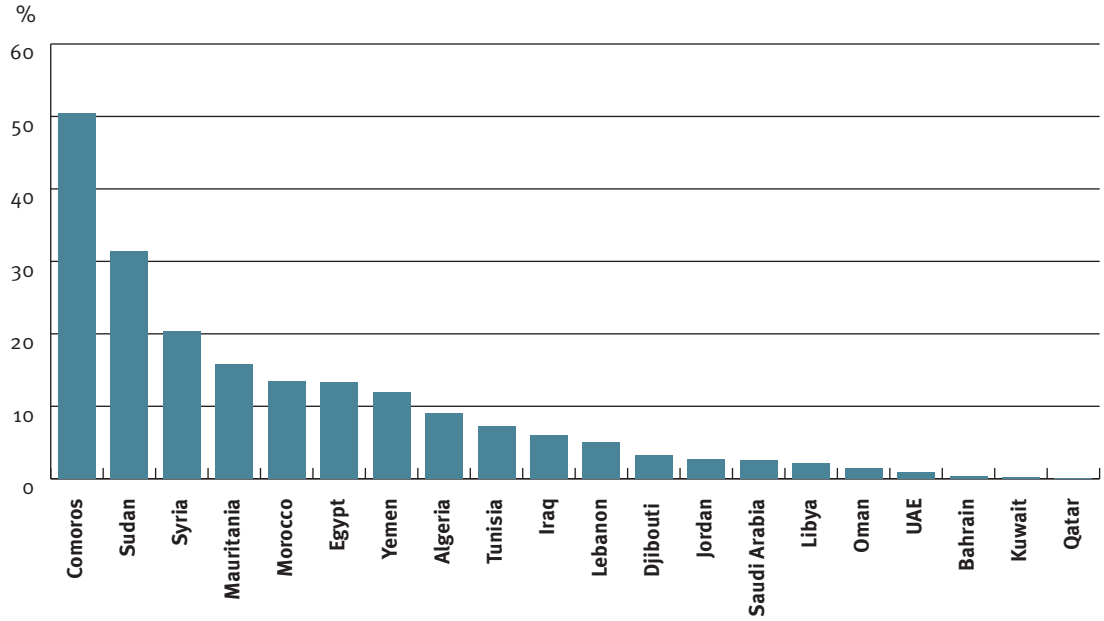
on the agricultural sector in the Arab region:[10]

- The need to produce more food to reduce Arab countries' enormous food imports bill ($28 billion in 2006).
- As the largest employer of people in the rural and marginal areas, the agricultural sector needs to halt its decline in job creation, especially for young people. In

Figure 2.4 Flood irrigation practices in Bahrain use water inefficiently

Source: Al-Zubari 2008.

Figure 2.5 Contribution of agriculture to GDP in selected Arab countries, 2010



Source: AMF 2011.

Box 2.2 Water demand management strategies in Tunisia and Morocco

Tunisia was one of the first countries to adopt a national water-saving strategy for urban and agricultural water use, continuing a tradition of frugal and patrimonial management of water, a scarce resource in Tunisia. Thanks to this policy, water demand for irrigation has stabilized despite droughts and increasing agricultural development. The policy has also ensured the water supply for tourism, a source of foreign currency, and cities, a source of social stability. The underlying principles of the Tunisian strategy are:

- A transition from isolated technical measures to an integrated strategy.
- A participatory approach that makes users more responsible (960 water user associations were created, covering 60 per cent of the public irrigated area).
- A gradual introduction of reforms and adaptation to local situations.
- Financial incentives to promote water conservation equipment and technologies (40-60 per cent subsidy for purchasing such equipment).
- Income support for farmers, allowing them to invest and hire more labour.
- A transparent and flexible pricing system that complements national goals of food security and allows a gradual recovery of costs.

Morocco's strategy for managing agricultural water demand focuses on the comparative cost of saving 1 cubic metre with the cost of developing an equivalent amount of new water resources. Adopting drip irrigation costs less than developing new water sources. The water saved is optimized by improving market gardening and tree growing yields. The productivity gains have been profitable, generating extra added value. Benefit-cost analysis reveals a return of more than 30 per cent of the capital costs. The benefits of the new strategy are not only economic but social (increase in farmers' income) and environmental (reduction of water abstraction).

Source: Benoit and Comeau 2005.

2006 thirty seven per cent, or 47.6 million people in an economically active population of 126 million, were engaged in agriculture, down from 47.8 per cent in the 1990s. More employment in the rural and marginal areas would reduce rural–urban migration and end the decline in the sector's contribution to GDP (Figure 2.5). In 2005 the agriculture's average contribution to GDP was a low 12.5 per cent, ranging from 0.3 per cent in Kuwait and Qatar to 34 per cent in Sudan.

- To meet the growing water needs of cities and industries, demands are mounting to force agriculture to redirect rising amounts of its share of clean water. To meet that demand today, governments have to resort to expensive desalination, an unaffordable option for some countries. Agriculture has to depend more on reusing water and using water of marginal quality to meets its requirements for production.
- Agriculture needs to adapt to climate change, as severe droughts, flash floods and crop-threatening weather anomalies are expected to increase.

These pressures point to a need for major reform of water policy in the agriculture sector. Agricultural performance indicators show that irrigation management is weak, characterized by deteriorating infrastructure, centralized administration, a large irrigation bureaucracy, low irrigation service fees and limited participation of water users in maintenance tasks. Water policies have focused on enhancing supply to meet growing demand rather than on managing demand and regulating water use. Irrigation water is widely subsidized and sold below operational costs despite the economic and environmental costs of overexploitation.

New policies and laws to regulate water use and manage demand are urgently needed. Groundwater extraction, like surface water allocation, must be metred and tariffed. Efficient agricultural techniques should be promoted through regulations, institutional reform, tax exemptions, pricing subsidies and capacity building for farmers (Box 2.2).

Several Arab countries are reducing irrigation water subsidies. Morocco and Tunisia have introduced volumetric pricing for public irrigation, charging farmers by the amount of water they use rather than by hectares under cultivation. Metring is a condition for estimating water balance and a technical tool for preserving water. Irrigation charges almost completely cover operations and maintenance

costs in Tunisia and are approaching full coverage in Morocco.[11]

Institutional reform, including capacity building, effective coordination, proper organizational structures, and accountability and transparency, is urgently needed. Many Arab countries have implemented institutional changes in their agricultural and water sectors. A major step was separating the water authority from the agricultural authority. Growing awareness of the value of decentralization and farmer participation in water distribution has also led several Arab countries to adopt participatory irrigation management. Egypt, Jordan, Libya, Morocco, Oman, Tunisia and Yemen have promoted water user associations as active partners in operating and managing irrigation systems. Users help determine service levels, charges and water allocations. Elected governing boards follow clearly established, transparent procedures and members must finance part of the infrastructure and the operations and maintenance costs.[12]

Incentives, particularly financial, are needed to improve irrigation efficiency. Managing irrigation water demand, including adopting water-saving technologies and crops, is essential. Economic and financial mechanisms include permits, rebates, tax incentives, targeted subsidies, price controls and water rights. Relevant R&D must also be promoted and properly targeted. Research can focus on developing crops that tolerate drought and salinity. Other areas of development should involve livestock management and support. R&D should not be limited to technological improvements but should also address knowledge transfer and identify optimal governance and management options at local and national levels.

Better procedures are needed for assessing irrigation performance, along with better systems to manage water conveyance, allocation and distribution.[13] North African Arab countries, which allocate more than 80 per cent of their water resources to agriculture, should increase irrigation efficiency, as the opportunity to save water is notably higher there than in other sectors. For instance, reducing transport losses by 50 per cent and improving irrigation efficiency from 40-50 per cent to 80 per cent could save nearly 52 cubic kilometres a year, or more than 40 per cent of the region's water losses, and thus provide an additional supply of nearly 20 per cent of demand. Possible irrigation savings constitute more than 70 per cent of water savings.[14]

The availability of inexpensive, heavily subsidized water has led to overuse and waste. Yet water remains a scarce resource in almost every Arab country, so conservation is thus essential. Many argue that pricing is the most effective method to ensure conservation, but a major governance issue is how to provide the public with adequate, inexpensive water. An answer lies in imposing progressive tariffs for drinking water and rationing water in agriculture, while demanding water pricing at actual cost in commercial activities and industry. A progressive water tariff ensures that basic human needs for fresh water are met at a low, subsidized price, while excessive use is priced at a tariff that reflects cost.

Municipal water sector

In almost all Arab countries, rapid urbanization challenges efforts to meet rising domestic water demand, especially in countries with tight budget constraints. Urbanization has risen from nearly 45 per cent of the population in 1980 to 56 per cent in 2010 and is expected to exceed 60 per cent in 2020.[15] Domestic water consumption is expected to rise more than 60 per cent from 1998 to 2025, increasing from about 13.2 billion cubic metres to about 30, an average increase of 4.5 per cent a year.[16]

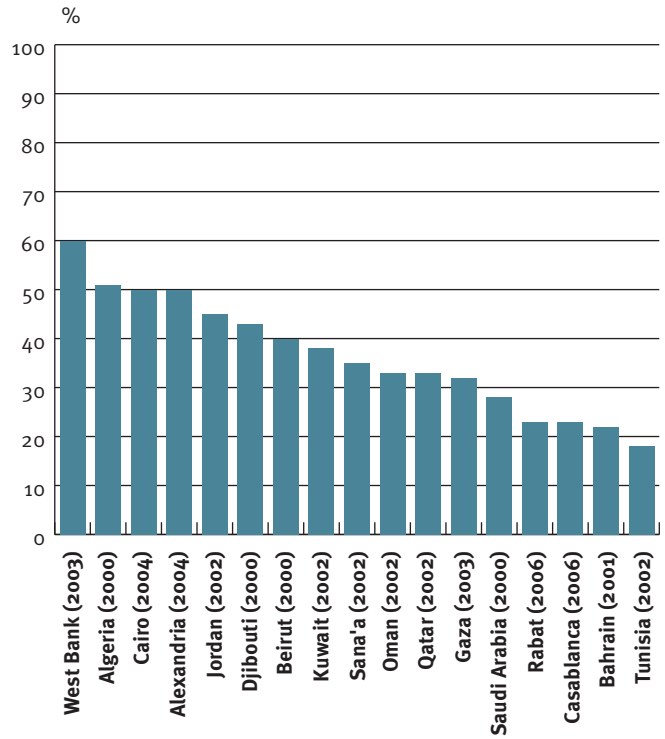
Domestic water consumption per capita varies considerably in the Arab region, both among and within countries. In the Gulf Cooperation Council countries, it ranges from 300 litres per day to 750 among the world's highest. The rise is attributable to many factors, including government subsidies, the absence of price signalling and demand management, and a government focus on water production from aquifers and desalination plants. Government subsidies mean that water tariffs are low, at around 10 per cent of the cost, providing no incentives for consumers to save water.[17]

One of the municipal sector's major challenges is to reduce unaccounted-for water (or

nonrevenue water) in the distribution network. The World Bank defines unaccounted-for water "as the difference between the amount of water delivered by the water utility and the amount actually billed. [Unaccounted-for water] includes distribution network losses by leakage, illegal water use and inaccurate metring. The [unaccounted-for water] can reach more than 60 per cent in poorly maintained distribution networks in some Arab cities, including the financially incapable and capable" (Figure 2.6).[18] The volume of unaccounted-for water in Arab countries, ranging from 15 per cent to 60 per cent , greatly exceeds that in developed countries, where it ranges from less than 10 per cent for new systems to 25 per cent for older systems.[19]

Governance schemes need to take unaccounted-for water into account. Particularly in water-scarce Arab countries, this lost water carries a high opportunity cost, equivalent in the Gulf countries to the cost of desalination and pumping.[20] Reducing unaccounted-for water by improving water distribution systems should thus be a major governance objective.

Figure 2.6 Nonrevenue water in water supply utilities in selected Arab countries and cities



Source: World Bank 2007.

Competition among users

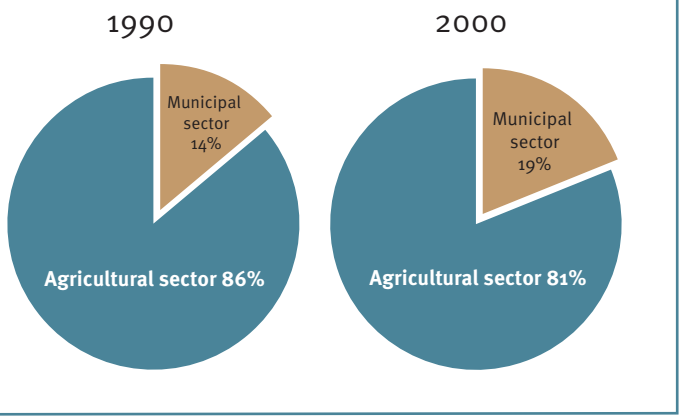
Balancing multiple water uses amid water scarcity and competing interests can generate social and economic problems. Agriculture produces only a small share of GDP, for example, but its abandonment in favour of more productive sectors such as heavy industry and tourism would make Arab countries even more dependent on food imports and leave millions of unskilled labourers jobless. This could further stimulate the exodus to cities, increasing socio-economic pressure on overpopulated, inadequately served poor urban areas. The proportion of agricultural workers in Arab countries is about 30 per cent, excluding Mauritania, Sudan and Yemen. Several studies indicate that agricultural employment has been declining in recent years. In Egypt, the employment rate in agriculture fell from 41 per cent in 1983 to below 32 per cent in 2008; in Syria, from 31 per cent to 15 per cent; and in Jordan, from 7 per cent to below 3 per cent.[21]

Rising domestic water consumption will reduce the water available for agriculture. Although domestic water consumption accounts for only about 10 per cent of the region's water use, it is expected to increase with urbanization and population growth (Figure 2.7). In the Gulf countries, the municipal sector's share rose from 14 per cent in 1990 to 25 per cent in 2010,[22] as the urban population rose from 78 per cent to 88 per cent.

Domestic water consumption is expected to continue to rise due to high natural population growth rates and intercity and rural–urban migration.[23] Growth from migration is particularly pronounced in Gulf Cooperation Council countries, which rely on a substantial foreign labour force, and in conflict-ridden areas. Jordan is receiving influxes of refugees from Iraq, Syria, and the State of Palestine.

Although Arab countries recognize that water is a public good, ambiguous water rights frequently cause local tension and conflict. Water rights take different forms. In Egypt, water rights, tied exclusively to land, apply only for irrigation. Allocations are thus tied to

Figure 2.7 Water use distribution between the municipal sector and agricultural sector in the Gulf Cooperation Council countries



Source: Al-Zubari 2011.

landholding and the types of crops licensed to be grown on each allotment. In Lebanon, the allocation law concerning private water rights focuses on water extraction. Water from wells drilled on private land, where flow does not exceed 100 cubic metres a day and 150 metres in depth, is exempt from permitting or other authorization requirement and is subject only to a declaration fee. Morocco allocates all water held in the public domain through a permit system administered by catchment basin authorities. Well-established systems of water rights and trading have been practiced for decades, despite more recent government regulations restricting farmers' sale of fresh water to urban users.[24] Morocco uses a system based on the Jrida, a publicly available list of water rights defined as hours of full flow.

Unclear water rights and weak infrastructure management can lead to confusion and conflict among government agencies and water users about entitlement to water. In most Arab countries, specialized government agencies distribute water permits and manage large-scale irrigation networks. Many countries lag in establishing legal instruments to regulate water allocation. Creating a reliable legal permitting system for drilling water wells and managing groundwater is essential, though permits are often issued based on unscientific rules such as distance between wells. Rules for trading water rights will also support the development of water markets.[25]

Severe competition for scarce water resources will inevitably put more pressure on the agriculture sector, with costly social and political repercussions. Governance options should address this issue carefully. Through transparent, participatory approaches, water can be allocated among sectors to meet pressing, prioritized needs. Using agricultural water more efficiently is essential to ensure the highest possible return. The agriculture sector particularly needs transforming measures, such as using more nonconventional water, managing crops and helping agricultural workers transfer to other jobs.

Water rights, social equity and economic development

In the water-scarce Arab region, using water resources equitably and reasonably is a key challenge for effective water governance. "Equity in this sense does not mean that everyone should be given an equal amount of water. Rather, it means that everyone should have fair opportunities to the access, use and control of water resources. It also means that everyone should be aware of the drawbacks of water exploitation so that no part of the society would be disadvantaged."[26] Balancing economic efficiency, social equity (Box 2.3) and environmental sustainability is a major goal for effective water governance.

Many countries face water equity challenges. Access to clean drinking water and sanitation is often lacking for rural areas, poor people and groups marginalized because of race, caste, tribe or gender. These inequities reflect social and political marginalization that systematically excludes poor people from opportunities and services.[27] Especially in the poorest countries, rural areas lag behind cities in access to drinking water and sanitation (Figures 2.8 and 2.9), but inequity exists even in cities, where people in unserviced areas rely on private water supplies, often at much higher costs. Increasing the proportion of people with access to water and sanitation will require

Box 2.3 Human rights to water and sanitation

The Action Plan of the United Nations Water Conference in March 1977 recognized the human right to water for the first time. It declared that "all peoples, whatever their stage of development and social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs." The fourth principle of the Dublin Statement on Water and Sustainable Development in 1992 indicates that "water has an economic value in all its competing uses and should be recognised as an economic good. But within this principle, it is vital to recognise first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognise the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use and of encouraging conservation and protection of water resources."

In July 2010, the UN General Assembly Resolution A/RES/64/292 formally recognized the right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to realizing human rights. The resolution calls upon states and international organizations to provide financial resources and help capacity building and technology transfer within countries, especially developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all.

The World Water Council, the Third World Water Forum, the Global Water Partnership, the Dublin Statement on Water and Sustainable Development and the United Nations have endorsed the view that the "human right to water is indispensable for leading a life in human dignity," and that access to water and sanitation is a "prerequisite for the realisation of other human rights."

In September 2010 Human Rights Council Resolution A/HRC/RES/15/9, following the UN General Assembly resolution, affirmed that rights to water and sanitation were part of existing international law and confirmed that these rights are legally binding upon states. It also called upon states to develop appropriate tools and mechanisms to fully realize human rights obligations of access to safe drinking water and sanitation, including in currently underserved areas.

Source: UN 1992b, 2010a,b; Camdessus and Winpenny 2003, p. 7.

increasing the empowerment, participation and social mobilization of poor people, who are often more vulnerable to livelihood insecurities and water-borne diseases.

Socio-economic and political disparities usually result in unequal decision-making powers among stakeholders, so that water policy outcomes tend to favour already powerful groups. Effective water governance systems must pursue social equity to ensure that all people have access to drinking water of sufficient quantity and quality. The best way to ensure equity is through participation in water management by all stakeholders, especially poor people.[28] To ensure that women and poor people receive a fair share of water, they must be represented in the institutions that decide how to allocate water.

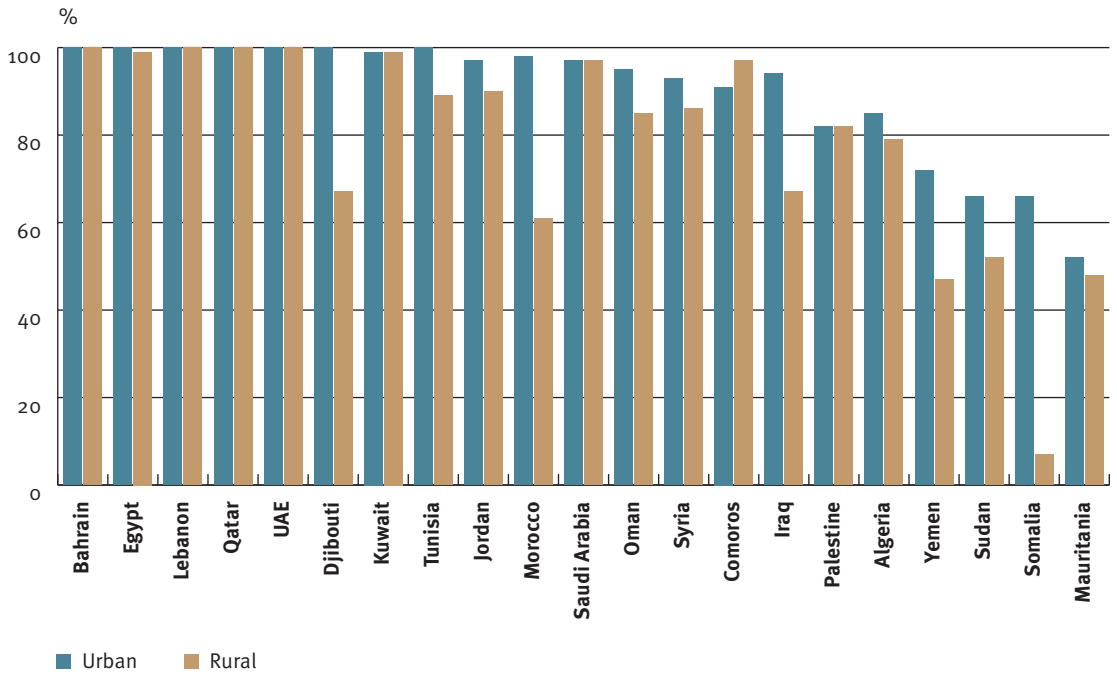
Gender equity and women's empowerment are declared goals for all Arab countries. Women should play effective roles in identifying water governance options at all levels. A first step can be training programmes on gender awareness and analysis for water professionals and the community. Gender issues and participatory approaches must be integrated into local and regional businesses, especially in conflict zones and agricultural and poor communities. Reforms must also be introduced at the local community level. Water governance and integrated water resources management (IWRM) must promote gender analysis tools to investigate the effect of planned developments on local women (Box 2.4).

Social impact of water scarcity

Water scarcity creates complex social dynamics. Societies have varying adaptive capacities to cope with water deficits—countries with little rainfall and surface water availability differ in adaptive capacity from countries with oases and rivers. And competition over an increasingly limited resource in often unhealthy, overcrowded and insecure environments is pitting unequal power-wielding interests against each other: urban versus rural, rich versus poor, economy versus ecosystems.

When water scarcity is severe, water allocation often reflects and emphasizes social, political and economic inequities and can cause

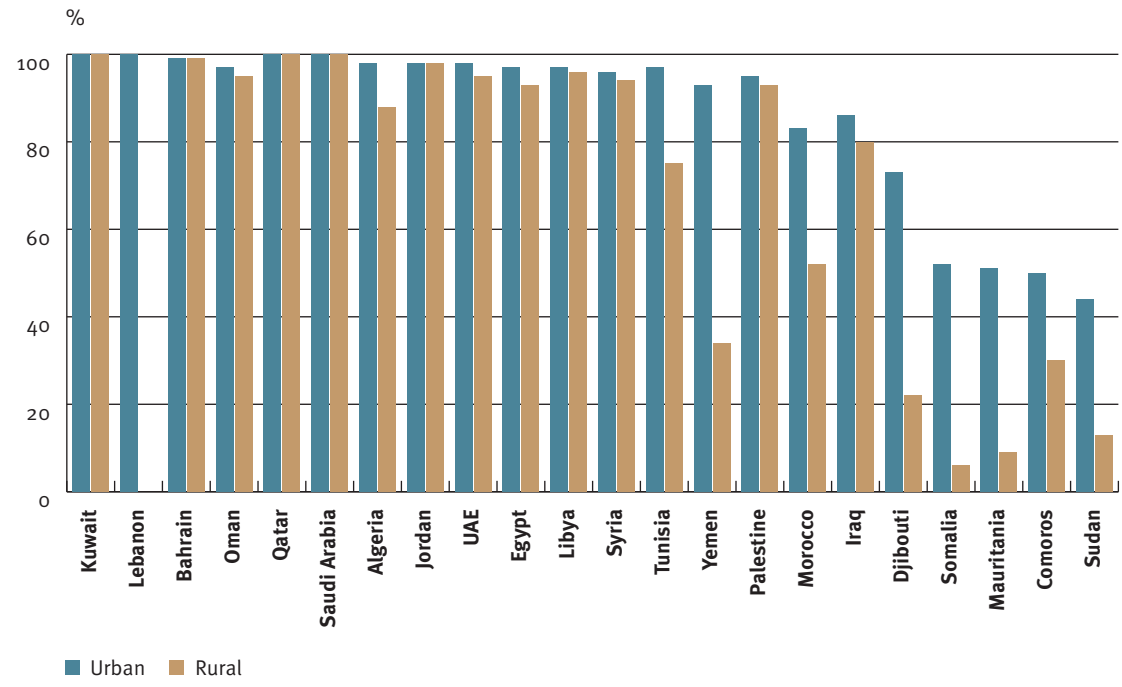
Figure 2.8 Access to improved water source in Arab countries in urban and rural areas, 2011



Note: No complete estimates available for Libya.

Source: WHO and UNICEF 2013.

Figure 2.9 Access to improved sanitation in Arab countries in urban and rural areas, 2011



Note: No complete estimates available for Lebanon.

Source: WHO and UNICEF 2013.

conflicts to emerge or escalate, especially within countries. Influential positions in politics and society are often linked to water access, a problem now facing the decentralized traditional governance frameworks in Yemen (Box 2.5).[29]

A study in the northern Jordan Valley on the impact of water shortages on the region's cultivated area, income and labour concluded that cutting back irrigation water reduced cropping intensity, minimized cultivated area, reduced labour and lowered net income. Decreasing the water supply by 20 per cent reduced the cultivated area by about 14 per cent, leading to a net income decline of 15 per cent.[30]

Water conflicts can also exacerbate other tense socio-political issues, including border disputes, environmental problems, political identity and megaprojects (such as dams and reservoirs). In the Arab region, water scarcity is thus a threat to national security, social well-being and political stability.

Meeting water-related Millennium Development Goals

Access to improved water and sanitation services in the Arab region rose during the 1990s (see Figures 2.1 and 2.2), in line with the international community's adoption of the Millennium Development Goals (MDGs).[31] Water and sanitation had also moved to the top of many Arab countries' agendas as important to development and human well-being, but in many countries progress is still slow.

Between 1990 and 2008 about 73 million people in the Arab region gained access to improved drinking water, and about 94 million to improved sanitation.[32] But in 2010 about 18 per cent of the Arab population still lacked access to clean water and about 24 per cent lacked access to improved sanitation.[33] Most of these people live in low-income, occupied or conflict-ridden countries. And disparities in water services are large between rural and urban areas. In 2010 only 71 per cent of the population in rural areas had access to improved drinking water sources compared with 91 per cent in urban areas. In sanitation the disparity is even greater: 62 per cent of the population in rural areas had access to improved sanitation compared with 88 per cent in urban areas.[34]

Meeting the water and sanitation target for MDG 7 of halving the proportion of the world's population without sustainable access to safe drinking water and sanitation by 2015 would cost about $62 billion for water and $100 billion for sanitation.[35] Low-income countries do not have the financial resources to make this kind of investment. Rapid urbanization in several Arab countries is greatly increasing the share of the population without adequate water and sanitation. Even in countries with freshwater resources, water pollution creates challenges. In Egypt's Nile Delta region, for example, the potential health benefits of government-ensured access to water are eroded by high pollution

Box 2.4 Women are especially vulnerable to the effects of climate change

Women, as other disadvantaged groups, are especially vulnerable to climate change. Current socio-economic and cultural constraints affect women disproportionately. Women in Arab countries, especially the poorest ones, already suffer high rates of illness and death related to pregnancy and other reproductive functions. The average maternal mortality rate in Arab countries is around 270 deaths per 100,000 live births, but it rises to more than 1,000 deaths in the poorest Arab countries (Mauritania and Somalia) and falls to 7 for every 100,000 births in Qatar. The impacts of climate change could put more pressure on vulnerable Arab women, causing serious health problems and diseases.

A study in western Sudan indicated that women are usually the last to migrate when drought strikes their lands. Men usually leave their lands first in search of work and income, leaving women and children behind. Women then shoulder the responsibility of managing the household's dwindling resources.

When disasters strike, they hurt whole communities, but women often bear the brunt. Floods frequently claim far more female victims because women's mobility is restricted and they are not taught how to swim. The devastating flash floods accompanying the tropical storm that hit the Hadramawt governorate in Yemen in October 2008 killed 80 people and displaced 20,000–25,000. Most of the displaced were women and children. One school sheltered 900 women and 550 children (with 100 people staying in one room). A recent paper on gender and climate change in the Arab region concluded that the prevailing socio-economic inequalities in the Arab region could render women more prone to a range of climatic and socio-economic impacts.

Source: UNDP 2006; Osman-Elasha 2007, 2008

Box 2.5 Scarcity, conflict and adaptation in the Sa'dah basin

Over the past thirty years, the very dry Sa'dah basin in Northern Yemen has experienced a huge population explosion as a result of natural growth, returning migrant workers and internal migration in response to economic opportunity, especially in agriculture. Investment in the land suited this tribal region's traditional values. The government improved agricultural profitability by imposing a fruit import ban so that farming would be an attractive investment. The soaring demand for qat has made this crop very attractive to farmers.

Agriculture's profitable growth was based on the rapid groundwater development. Until the 1970s most land in Sa'dah was communally owned grazing land, but the run-off rights from this land belonged to individual landowners in the lowlands. Agriculture was not allowed on the grazing lands because it would reduce run-off, so tubewell irrigation could not develop on the slopes. A deal was negotiated allowing the tribal owners of the pasture rights to convert half of the slope land to agriculture if they compensated the owners of the run-off rights with the same right on the other half of their land. In 1976 a local cleric promulgated this as a fatwa, and the rule change has been followed ever since.

As agriculture became more profitable and remittance capital became available, many tribal communities privatized their common lands and distributed them to households. New elite commercial farmers have emerged in the Sa'dah area, and land and water resources have been widely redistributed by market forces. Qat (previously scorned by proud tribesmen as "the tree of the devil") is being planted on a large scale.

As a result, the water table has plummeted and springs have dried up. Conflicts over water and land have intensified. These tensions may be spilling over into the region's growing fundamentalist sectarianism and civil strife. Sa'dah exemplifies economic growth and the capacity to adapt to market opportunities, but its communities have not shown a comparable "downside" capacity to adapt to scarcity. "Tribal communities and villages are not yet addressing the groundwater problem cooperatively."

Source: Lichtenthaler 1999.

levels from raw sewage.[36]

Although a fairly large share of the region's population has access to improved drinking water, access is not always reliable, especially in low-income areas. Water shortages are a major problem in key cities such as Amman (Jordan), Damascus (Syria), Sana'a and Taiz (Yemen), and in the West Bank and Gaza (State of Palestine). In Yemen, annual groundwater extraction rates exceed natural recharge rates by about 50 per cent; rate differentials are even higher in the Sana'a basin.[37] Rapid population growth (3.6 per cent a year) is outpacing new water supply networks. Sana'a faces severe water shortages. Less than half of its population receives water from the public network; the rest rely on private water distributors. Around six public wells run dry every year, and water well depth now reaches down to the southern part of the Sana'a basin.[38] In Amman, shortages have become so severe that many residents receive water only one day a week. The government is addressing the problem, including piping water to the city from the Rum-Disi aquifer about 325 kilometres away. But the largely fossil water aquifer is already showing signs of depletion and increasing salinity.[39] In Beirut, overuse of the thousands of wells under the city, despite average annual precipitation of 800 millimetres, is leading to salt intrusion.

Damascus, long blessed with abundant clean drinking water, has experienced more frequent shortages as the population grew to 3.8 million in 2000. The city now experiences long water shut-offs (16–20 hours a day) during several months. The situation worsens during the summer when water demand rises. In the West Bank and Gaza, water is available for only a few hours a day. In Oran, Algeria, water is supplied every other day during drought years. In several of the region's major cities, water is available only once or twice a week, depending on the district. The intermittent supply of urban water accelerates infrastructure degradation and increases the percentage of nonrevenue water. In addition to population growth and severe and persistent drought conditions, inefficient irrigation and large volumes of unaccounted-for water due to distribution network leakage contribute to water shortages.[40]

Reaching the MDG for water supply and sanitation requires large investments and improved water technology across the region. Many Arab countries rely mainly on imported water-technology equipment, and the domestic private sector is not filling the gap left by governmental agencies. Without effective, government-funded agricultural extension programmes, for example, many Arab countries are not moving into crops with lower water requirements or using newer, water-saving

irrigation techniques. Rural areas and small communities also need cost-effective, reliable technologies for wastewater treatment to improve sanitation.

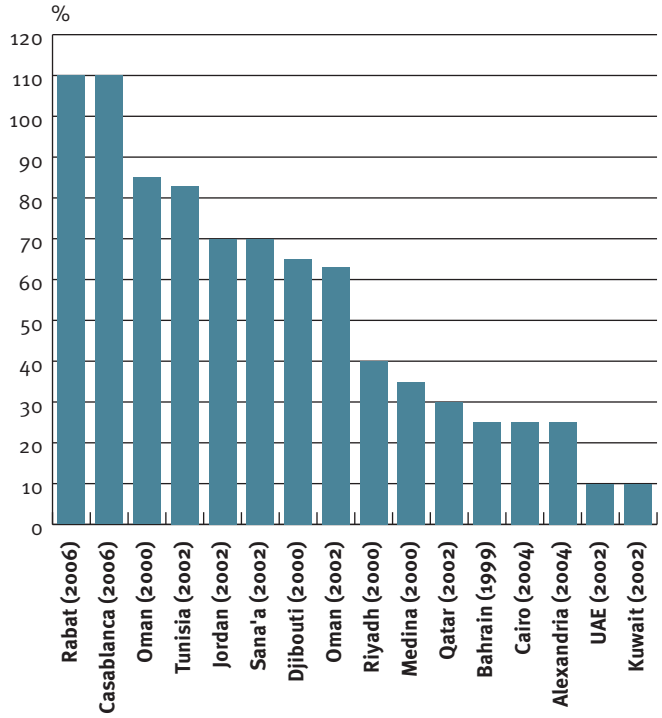
Most water utilities in the Arab region are caught in a vicious cycle of poor services, low tariffs because of subsidies, and low consumer expectations about services, leading to consumer resistance to price increases.[41] Many countries heavily subsidize connections to the domestic water supply network, water consumption, or both, so that consumers pay only a fraction of the water's true cost. In almost every city, insufficient revenue is collected to cover water supply and operations and maintenance costs, let alone depreciation of assets (Figure 2.10).

Water governance should aim to secure sufficient water of appropriate quality at an affordable price. But direct subsidies of services usually lead to misuse, abuse and service deterioration, particularly in times of financial strain. Lack of incentives for improvement makes the situation even worse.[42] Without adequate cash flow from service users, water agencies must depend on government budget transfers. As these transfers are often based on precedent, they become biased towards paying wages rather than creating effective operations and maintenance and caring for existing assets (such as water/wastewater plants and distribution networks) rather than developing new ones. Deferred maintenance leads to premature deterioration of assets and eventually to more costly rehabilitation. Routine maintenance for irrigation and the domestic water supply could prevent this situation and lower costs.

Socio-economic policies on water pricing prevent cost recovery, discourage maintenance spending, lower service quality and threaten the financial sustainability of utilities. Water users should pay the full cost of the services they use. Full cost recovery could create the incentives needed to improve water services. Carefully and transparently targeted subsidies could ensure that poor people have access to water services, avoiding any negative social equity impacts.[43]

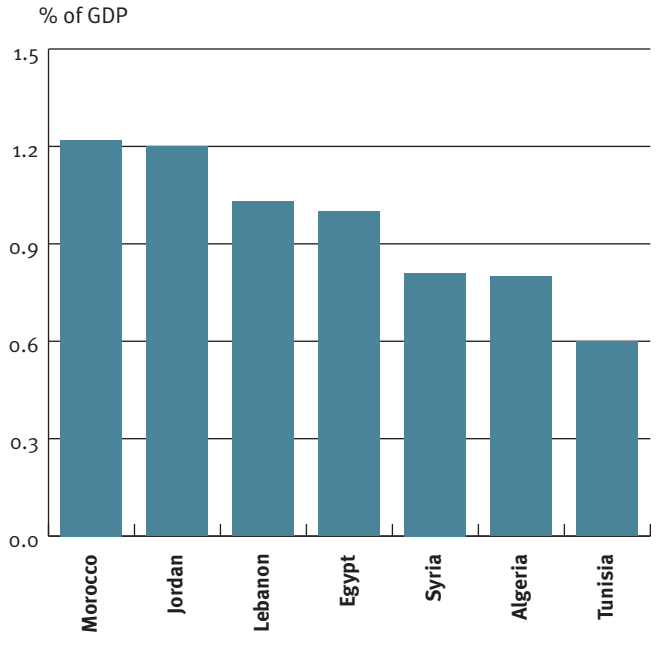
Informal settlements—slums constructed without permits on the outskirts of large cities

Figure 2.10 Operating cost recovery ratio for utilities in selected countries and major cities in the Arab region, latest year available



Source: World Bank 2007.

Figure 2.11 Annual cost of environmental degradation of water in selected Arab countries



Source: World Bank 2007.

Box 2.6 Somalia food crisis: origins and threats

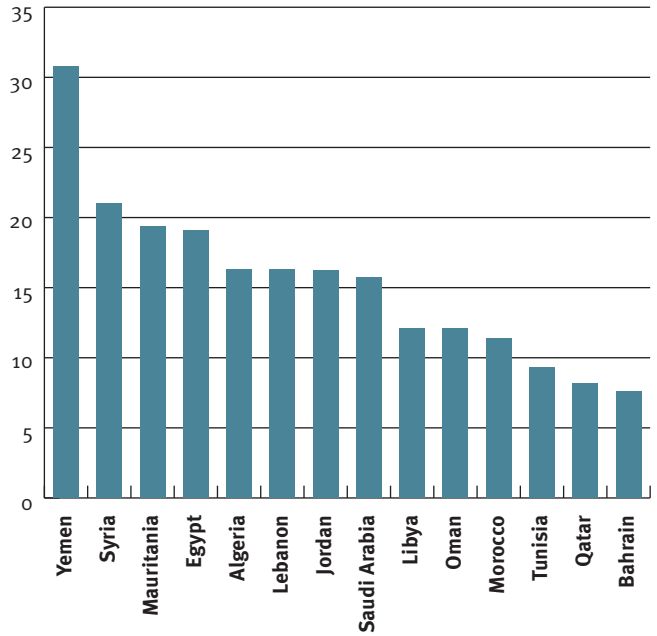
In summer 2011 the United Nations declared a state of humanitarian disaster in Somalia and parts of Ethiopia and Kenya. The region is experiencing an acute food and livelihood crisis, the first in the 21st century. Severe and recurrent droughts, the worst in six decades, have devastated pastoral livelihoods in Somalia, where 60-65 per cent of the population relies on livestock. Soaring global food prices have exacerbated the situation. According to the United Nations Food and Agriculture Organization, maize and sorghum prices were 150 per cent and 200 per cent higher in 2011 than in July 2010. A long civil war, by blocking international aid from reaching affected areas, further impeded efforts to prevent famine.

Some 3.7 million Somalis, or nearly half the population, are in crisis, 2.8 million of them in the south. People have been forced to abandon their homes and land in search of food and water, crossing into neighbouring countries. The international community is contributing large amounts of humanitarian aid to resolve Africa's food crisis, but the assistance falls about $1.1 billion short of the $2.4 billion needed, according to UN humanitarian agencies.

Simply increasing aid is not enough to ensure food security for the region. Additional solutions include investing more in agriculture and infrastructure and improving adaptive policies for weather patterns.

Source: FAO 2011.

Figure 2.12 Food imports in selected Arab countries, 2010 (% of merchandise imports)



Source: World Bank n.d.

present another challenge. Governments must decide whether to deny drinking water services to illegal settlements or to recognize people's right to clean water.

Effective water and sanitation governance practices are vital for achieving the MDG targets for water and sanitation. To integrate the targets into the region's national development plans and foster trust, partnerships need to encompass communities, financing institutions, consumer associations, businesses and decision-makers and to ensure effective collaboration among all these stakeholders.[44]

Water and economic development

Effective water governance is linked with economic development. Water governance and policy formulation should recognize national and regional economic dimensions, and economic policies should consider water status and sustainability in quantitative and qualitative terms. Water quality has economic ramifications: the cost of water's environmental degradation may reach well beyond 1 per cent of a country's GDP, as in Jordan and Morocco (Figure 2.11).

Where water scarcity is severe, water resource management problems have been viewed as the exclusive domain of the water sector, insulating the water economy from market forces.[45] As a result, water's economic value is rarely considered in setting agricultural and trade policies. Despite water's scarcity, high water-consuming crops such as rice, sugarcane and banana are still being grown and irrigated in several Arab countries, including Egypt and Jordan. Water is a key driver of macroeconomic and sectoral policies in the region.[46] But key political, environmental and social drivers of water policy lie outside the sector.[47] Energy, global trade, agricultural policy, fiscal policy, food security, self-sufficiency and urbanization with its associated changes in demography and land use directly influence the political choices that affect water use.

Most Arab countries are pursuing policies to transform their economies. Reform of water governance should be among these structural

economic reforms. Water affects almost all economic activities, so good water governance to ensure sustainability is essential to economic growth.

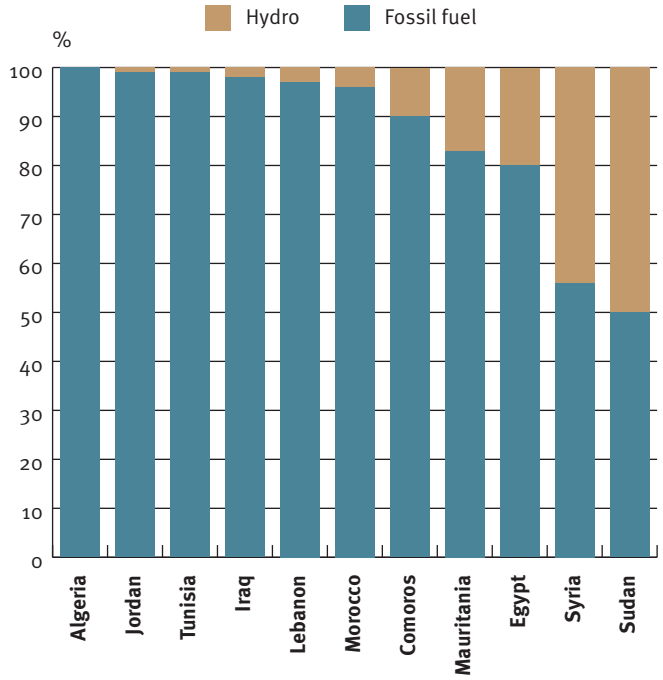
Water and food security

Global food security is highly unstable. Biofuels, export bans, poor harvests, fluctuating energy prices and rising demand from growing populations have pushed up food prices, sparking riots and instability and driving millions of people in developing countries further into poverty and hunger. The 1996 World Food Summit emphasized that "food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[48]

Competition over increasingly limited water resources severely challenges Arab countries' ability to feed their growing populations (Box 2.6). Governments have responded by providing some water for all and more for others according to government priorities. But reallocating water from one sector to another has political and social implications as well as economic. Although most water in the Arab region goes to agriculture, crucial for food production and rural employment, agriculture's contribution to GDP is low. Many people argue that water should be reallocated from agriculture to the industrial and municipal sectors, despite the negative repercussions for agriculture and rural employment.

Even though Arab countries lack adequate water to grow enough food to feed all their people, self-sufficiency at any cost was a goal during the 1960s and 1970s. The unsustainability of this approach led Arab governments to look at alternative ways to achieve food security, such as improving agricultural production, maximizing water productivity and relying more on food imports (Figure 2.12).

Figure 2.13 Electricity production by source in selected Arab countries



Source: CIA 2003.

Table 2.1 Estimated energy consumption for desalination processes
Kilowatt hours per cubic metre

Process	Steam energy	Electric energy	Electric energy equivalent
Seawater multistage flash	7.5 – 11.0	2.5 – 3.5	10.0 – 14.5
Multiple effect boiling	4.0 – 7.0	2.0	6.0 – 9.0
Vapour compression	—	7.0 –15.0	7.0 – 15.0
Seawater reverse osmosis	—	2.5 – 8.0	2.5 – 8.0
Brackish water reverse osmosis	—	0.5 – 2.5	0.5 –2.5

Source: Al-Jamal and Schiffler 2009.

Box 2.7 Water in customary laws and traditions

Because water was scarce in early agrarian and nomadic Arab societies, fairly complex systems of tribal laws and Islamic doctrine developed to manage and share it. A good illustration is the Falaj, an underground aqueduct water system in Oman. The Falaj's main structure consists of the mother well, which can be as deep as 65 to 200 feet; the main channel; and the access shafts, which are built every 50 to 60 metres along the channel. "Each farmer has a share of water depending on the size of his farming plot(s) and on his contribution to the Falaj construction. As water is considered a source of life within the Omani society, the Falaj system is managed and maintained by local communities." The system is based on accountability and transparency and has been functioning successfully for decades. The Qanat underground system, the Saqia (waterwheel) and other traditional water allocation schemes have lasted to this day. The very strong collective values that prevail in Arab societies have been essential for these practices' success and sustainability. In Spain, farmers are still using the sequia, the old water distribution networks established by the Arabs during their conquests.

Source: Majzoub and others 2010, p. 27; Jagannathan, Mohamed, and Kremer 2009.

More than half of the food calories consumed in the region are now imported; this share is expected to rise to 64 per cent over the next two decades.[49] A 1994 study showed that the region's food imports were equivalent to 83 billion cubic metres of virtual water (the amount of water used to produce food or other products), or 11.9 per cent of the region's annual renewable water resources. For some countries, this share was much higher: Saudi Arabia (580 per cent), Libya (530 per cent), Jordan (398 per cent), Algeria (87 per cent) and Egypt (31 per cent).[50] With population growth and an improved standard of living, these figures must be much higher today.

Arab food security could be achieved through regional agricultural integration that combines the advantages of all the Arab countries human, financial and land and water resources. Joint agricultural projects could be implemented using advanced agricultural methods supported by active R&D programmes and effective water and land governance.

In April 2008, in a unified effort to address the food crisis, Arab countries issued the Riyadh Declaration on Promoting Arab Cooperation to Face the Global Food Crisis under the auspices of the Arab Organization for Agricultural Development. The declaration calls for sound trade and investment policies to enhance food security in the short and long terms, through public-private partnerships and enhanced inter-Arab agricultural trade.[51]

As water is essential to sustainable development, low-income regions with scarce water resources are especially threatened by food crises. The Arab countries most vulnerable to food price fluctuations are Iraq, the State of Palestine and Yemen, with their high poverty levels, and Jordan and Lebanon, large importers of food and fuel.

To reduce vulnerability, governments should actively support agriculture and efficient use of water and land resources. Implementing food security policies at the regional, national and household levels, governments in the Arab countries should focus on:[52]

- Improving food shortage early warning systems.
- Increasing the capacity of strategic food reserves.
- Securing better trade deals with major food exporters.
- Supporting social safety nets to benefit vulnerable populations.

Water-energy nexus

Water and energy use have much in common. Both are essential for healthy, productive human societies. Both also derive from natural resources, and their use by people affects ecosystem sustainability. And in Arab countries, both require major improvements in reliability and quality.

Water and energy are also strongly interdependent. Energy is required to use water: energy is needed to lift, move, process and treat water at every phase of its extraction, distribution and use. And water is needed to use energy: water is used directly and at various intermediate phases in power generation. Desalination, electricity generation and oil exploration and production manifest this interdependence. Both energy and water are threatened by waste.

In consuming energy to use water, unreliable electricity service leads farmers to use oversized engines, urban dwellers to pump water into storage tanks and industrial consumers to invest in backup power and water systems. In consuming water to generate electricity, power plant inefficiencies result in serious deterioration of water and other environmental resources.

Although intricately linked, water and energy have not always been managed as interrelated resources. Water and energy are run by separate utilities that do not always share the same interests or priorities; combining them could improve coordination. The energy sector in many Arab countries is dominated by state-owned monopolies of low efficiency, and mismanagement is common. Awareness of water and energy perspectives and their interdependence are essential for effective water governance and management.

Energy economics are driving greater awareness of the energy-water nexus as capital markets shift their focus to renewable energy development in response to diminishing fossil fuel supplies, higher energy prices and emerging environmental and utility regulatory actions. For most of the past century, hydropower was the renewable energy source, offering substantial flexibility and the ancillary benefits of water storage. Today, few feasible opportunities remain for new hydropower development (Figure 2.13).

The scarcity of fresh water in the region has promoted and intensified the application of desalination technology and co-production of electricity and water (Table 2.1).[53] Energy consumption in the region is growing at an annual rate of 3–4 per cent, twice the world average. Electricity generation is growing at a rate of 6-8 per cent a year, three times the world average. This rapid growth is due mainly to subsidized electricity rates, in addition to harsh summer weather and growing urbanization and populations. In Saudi Arabia up to 9 per cent of annual electrical energy consumption is attributable to groundwater pumping and desalination. Other Gulf countries are devoting 5–12 per cent or more of electricity consumption to desalination.[54]

Desalination is energy-intensive. Given the large market size and desalination's strategic role in the Arab region, installing new capacity will increase energy consumption. As energy production is based mainly on non-renewable fossil fuels, countries will need to develop renewable energy sources to power desalination plants. To address concerns about carbon emissions, Arab governments should link any expansion in desalination capacity to investments in abundantly available renewable sources of energy. The Arab countries must cooperate to enhance coordination and investment in R&D in water technologies. Acquiring and localizing these technologies will make them more reliable, increase their added value to the Arab economies and reduce their cost and environmental impacts. Renewable and environmentally safe energy sources such as wind and solar hold enormous potential for Arab regions located in the world's "sun belt."

Water institutions and policy formulation

Institutions and policy-making bodies responsible for water governance in the Arab region have always faced continuously escalating demands. Almost always operating in crisis mode, they aim to enhance supply to provide the required water. Structural institutional problems mar their operation, including low capacities, suboptimal performance, unclear distribution of roles and lack of effective coordination.[55] Shortcomings in water governance and management may become even more significant obstacles than water scarcity.

Water reforms are progressing unevenly in the region. Some countries, such as Bahrain, Djibouti, Egypt, Jordan, Lebanon, Libya, the State of Palestine, Saudi Arabia, Syria, Tunisia and Yemen have national water policies, plans or strategies that incorporate many elements of IWRM. Eleven of 22 countries assessed needed major water policy enhancements to implement integrated management plans.[156] Some countries have addressed the impacts of poor water management across the economy. Others have improved accountability and stakeholder

Table 2.2 Regional examples of shared resources in the Arab region

	Egypt and Libya	Iraq and Syria	Egypt and Sudan	Jordan and Syria	Lebanon and Syria
Basin	Nubian Sandstone Aquifer System	Euphrates	Nile River	Yarmuk	Nahr-El-Kabir
Dates	08-Jul-91	17-Apr-89	08-Nov-59	03-Sep-87	20-Apr-02
Principal issue	Water quantity	Water quantity	Water quantity	Water quantity, hydropower/ hydroelectricity	Water quantity
Allocation	Water share	Flow percentage	Water share	River share	Flow percentage
Other issues	-	No	-	Joint dam	Joint dam
River basin organization	No	No	No	No	No
Monitoring	No	Joint technical committee	Yes	No	Joint commission
Joint management	Joint authority	Yes	Yes	No	No
Groundwater[a]	Yes	No	No	No	No
Information exchange	Yes	Informal[b]	No	No	Yes

a. The Agreement contains provisions for groundwater resources.

b. There appears to be information exchange, but no formal document or guide to describe how this cooperative instance is to be implemented.

Source: IWLP n.d.; TFDD n.d.

involvement in water decisions. But improved water management policies are not fully reaching their intended goals in most countries. And even as policies develop, they often neglect social and economic goals, such as alleviating poverty and reducing unemployment. The region's ineffective and fragmented water management structures have also affected water decision-making, and weak regulatory frameworks and enforcement have led to degradation of water resources, public health risks and poor service coverage and delivery.

Solutions will differ, but certain actions can prepare the way for reforms, such as education about the multisectoral aspects of water governance and management, focusing on the region's water challenges. Government institutions responsible for water management must improve their governance and management practices and enable water institutions to function efficiently. Coping with scarcity and high variability in a context of population growth and economic change will involve difficult choices and painful changes. But recent progress in several Arab countries indicates that the region can meet its water governance and management challenges.

Legislation and regulation

Water legislation is essential to implement water policies and strategies (Box 2.7). It provides the legal framework for water governance, institutional reform, regulatory standards, management systems and regulation enforcement. Most Arab countries have recognized the importance of water legislation and regulation to promote water efficiency.[57] Consequently, they have started to reform and update existing laws or introduce new legislation. They are also encouraging decentralized and participatory governance at the national level to involve all stakeholders in decision-making. For the last 15 years Egypt, Jordan, Lebanon, Morocco, Oman, Palestinian National Authority (PNA) and Yemen have taken steps to reform their water legal systems. Morocco and Yemen have enacted framework water laws that reflect modern water principles and attempt to address their country-specific issues.[58]

Almost all Arab states have approved legislation to manage and protect their scarce water resources and improve water governance. But most efforts have failed due to inadequate compliance or poor enforcement. The "Laws and Regulations Standards and Permits"

approach has been highly ineffective. Existing laws should be embedded in the region's socio-economic, political and cultural specificities. They should also consider the differences between rural and urban areas and adapt standards and legislations for industries to harmonize with priorities within Arab societies. Arab policy-makers should integrate water-related legislation to develop a coherent, effective water policy.

Several Arab countries, including Morocco, have amended their water management systems to be more flexible and adaptive to growth and economic diversification. Faced with large arid areas, demand outstripping supply and unevenly distributed rainfall since 1975, Morocco has witnessed intensive surface water use and unsustainable aquifer depletion. But the country has a long history of sophisticated water institutions. In the mid-twentieth century, national water policy, led by well-educated technical elites from the Civil Engineering Corps, focused on growing dam infrastructure to modify natural flows and catalyse a shift from traditional to intensive agriculture.[59] The transition to water demand management started in 1998 with institutional reforms that paved the way for solid regional decentralized institutions (Watershed Basins). A comprehensive water law in 1995, a major breakthrough in Moroccan water policy, provided the country with some effective technical, financial and institutional tools to face the most crucial challenges in the water sector.[60] Lebanon also voted institutional reforms in 2000, but their application was hindered by political instability. Institutional changes cannot be witnessed over a short period of time, however. J. A. Allan noted in a 2008 keynote speech to the geography departments of King's College and SOAS that in many countries changes take at least 25 years to take hold.

The main legislation challenge, besides adequacy and modernity, remains enforcement and compliance. Water pollution is an obvious example. Many of the region's water resources, including rivers, lakes and groundwater, are becoming more polluted. The most frequent sources of pollution are chemicals, human and industrial waste and extensive agricultural

Box 2.8 Water security issues in Sudan after the separation of South Sudan

The South Sudan Government is developing an agricultural policy to guarantee food security for its population. This policy will focus on rain-dependent agriculture but will also include plans for agriculture irrigated with Nile waters. Domestic water supply schemes for urban and rural areas will depend mostly on groundwater and water harvesting systems, as rainfall in South Sudan amounts to about 600 billion cubic metres a year. These schemes are not expected to have any significant impact on White Nile flows.

All major hydropower projects planned in South Sudan fall within the reach of Bahr El Jabal before the Nile enters the Sudd swamp area, where it loses about 50 per cent of its flow. These hydropower projects are not likely to reduce the White Nile's annual flow and will thus have no negative impacts on socio-economic development in Sudan and Egypt. They are expected to bring large economic benefits to South Sudan through power trade with neighbouring countries, which are suffering from power shortages. The planned hydropower dams in South Sudan will also regulate the flow of the White Nile, thus leading to a more sustained flow during the low-flow season.

The water needs for major future irrigation projects amount to about 1.7 billion cubic metres. These projects are strongly linked to long-standing plans to increase Nile flows through water conservation projects in South Sudan. In addition to conserving water for Sudan and Egypt, these projects will provide substantial areas of fertile land through wetlands reclamation. Some projects proposed along the tributaries of Bahr Al Ghazal and Sobat are mainly rain-dependent but could be supplemented with surface water. The effect on Nile flow would be insignificant, however. In the northern part of South Sudan proposed irrigation schemes along the White Nile's banks encompass an area of about 400,000 feddans (one feddan is 4,200 square kilometres) and have water needs of about 1.3 billion cubic metres. These projects are to be irrigated using Jabal Awlia reservoir in Sudan, which extends up to the Malut area in South Sudan. Implementing these projects requires cooperation between Sudan and South Sudan. This cooperation would provide a good opportunity to resume the Jongoli canal, which could conserve 4 billion cubic metres a year, to be shared between Sudan and Egypt.

Irrigation development in South Sudan is thus not likely to have negative impacts on Sudan and Egypt. On the contrary, cooperation between Egypt, South Sudan and Sudan on Nile issues presents a great opportunity. The three countries must focus on sharing the benefits rather than continuing the vicious circle of water shares. Consolidating cooperation between the 11 riparian countries could open the way to a holistic agreement on the Nile River.

Source: Abdo and Abdalla 2011 , background paper for the report; Nile Basin Initiative n.d.b.

Box 2.9 Managing shared water resources: the Arab region's experience

Eleven African countries share the Nile river. Two of these, Egypt and Sudan, have signed bilateral agreements and accords, most notably in 1959. A wider constructive dialogue with other riparian countries has been established through the Techno-Nile Coalition and the Council of Ministers of Water Affairs of the Nile Basin States, which agreed to form a panel of experts and other negotiating committees to reach common grounds. This may lead to a comprehensive international agreement to regulate shared water usage. The River Nile Cooperative Framework Agreement has been developed, but only six of the riparian states have signed it: Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda. The Democratic Republic of the Congo is also expected to sign, but Egypt and Sudan are not.

The Jordan river, shared by Israel, Jordan, Lebanon, the State of Palestine and Syria and controlled mainly by Israel since 1967, is at the centre of the Arab-Israeli conflict. The Oslo Declaration of Principles, the current regulating document for relations between Israel and the State of Palestine, vaguely referred to water. Oslo II states that the Palestinians have water rights, but fails to define these rights. The Wadi Araba Agreement between Israel and Jordan also did not pay adequate attention to water issues. Water distribution remains a controversial issue: Israel overextends its water usage extraction (or diversion) and rights, leaving the Arab countries (Jordan, Lebanon and the State of Palestine) with limited access to their share. This problem highlights the urgent need to draft a fair and comprehensive agreement among the parties to regulate the distribution and protection of surface and underground resources.

Iraq, the Syria and Turkey share the Tigris and Euphrates rivers. Many bilateral agreements have been formed between the three countries, including the protocol signed by the Syria and Turkey in 1987 to control the flow of the Euphrates. The countries also formed a joint committee in 2008, but meetings were very irregular.

Iran and Iraq also share rivers—namely, the Shatt el Arab and Karon rivers—but Iranian authorities used these waters unfairly. Iraq submitted several objections, relying on international laws regulating water allocation among riparian countries. Unfortunately, no substantial agreement has been reached.

The Jubba and Shabele rivers, shared by Ethiopia and Somalia, are at the heart of many conflicts between these two countries. No efforts have been made to establish an arrangement over the rivers' use and exploitation. There is an urgent need to raise the issue and take the necessary measures to protect Ethiopian and Somalian water rights.

Source: Ksia 2009.

practices (overuse of pesticides and fertilizers). Inadequate institutional and structural arrangements to treat municipal, industrial and agricultural waste worsen the situation. Waste is commonly dumped into waterways, polluting most downstream sources. Such degradation of water resources poses national and international problems.

Managing shared water resources

Inadequate governance systems for shared water resources constitute another challenge for the Arab region. More than two-thirds of available surface water resources originate from outside the region and are managed unilaterally by the riparian countries. Almost all the shared river basins lack comprehensive international agreements.

Any disruption or pollution of these water resources in one country can damage adjacent countries' water quantity and quality. These transboundary effects may not be immediately apparent but may be very hard to reverse. Shared water resources thus play a significant role in the region's stability and development by creating hydrological, social and economic relations and interdependencies between countries, both Arab and non-Arab. Because many Arab countries depend on these water resources, water is a political issue that can strain relations with neighbours and lead to armed conflict. Cooperation and coordination across national borders and across the region to manage shared water resources sustainably is thus essential.[61]

Cooperation on shared water resources in the Arab region has been modest; the few agreements are bilateral rather than basin-wide.[62] Current cooperation modalities take many forms, from informal technical committees or expert meetings to more formal joint projects or interstate agreements (Table 2.2). But many shared water basins are still managed unilaterally, without legal agreements to ensure their proper and optimal utilization.[63] Given the mounting stress on the region's water supply, cooperation in managing shared water resources is imperative to ensure their sustainability in serving socio-economic development.

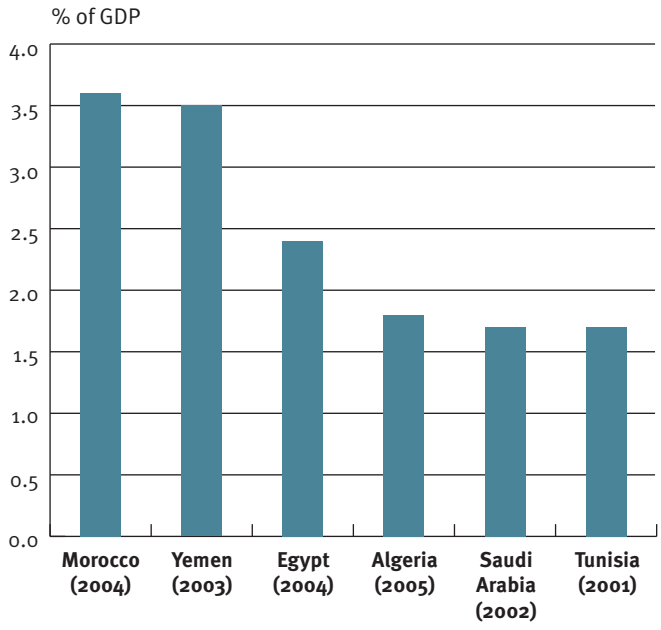
The Arab region has a striking absence of inclusive, comprehensive international water agreements on its most significant transboundary watercourses.[64] While some limited arrangements on transboundary waters exist for the Jordan, the Kebir, the Nile and the Tigris-Euphrates basins, they do not deal with optimization or planning, nor do they contain established principles of international water law such as "equitable and reasonable utilization" and the "obligation not to cause significant harm."[65] Most of these arrangements do not include all the riparian countries in the arrangement process—the Jordan River arrangement excludes Lebanon, the most upstream country. The lack of international agreement reflects the weak political and multilateral engagement between countries sharing the water. Without agreements to allocate water, countries race to establish infrastructure and claim the resulting acquired rights, but only countries with stronger economies and greater political and military power have had the financing to make these investments.[66]

As riparian countries intensify water development efforts to meet their growing demands, competition and conflict over shared water resources will increase, affecting the availability of shared water resources. Climate change—with its anticipated impacts on water resources in the mostly downstream Arab countries and the upstream non-Arab countries—will exacerbate the situation. These impacts will reduce renewable water resources, increase water resource variability and drought frequency and increase agricultural and domestic water consumption.

Uncontrolled development without joint agreements to manage shared groundwater sustainably has caused high depletion rates, increased pumping costs, deterioration of water quality due to mixing water among multi-layered aquifers, and the reversal of flow direction in some locations and across international boundaries. Groundwater development to meet increasing water demand will lead to further withdrawal of the shared aquifers reserve, potentially causing dispute among countries. Most of the reserves of these non-rechargeable basins are being used mainly for agricultural expansion and development and in an unplanned manner, and groundwater is being rapidly depleted.[67]

Because the overwhelming share of the region's water is devoted to agricultural production, the pressure on transboundary waters will not ease until the region reassesses the principles driving water allocation, not just between nations but also between sectors and users. Outdated or unrealistic food self-sufficiency policies, which continue to drive investments and often have severe implications for the countries sharing the water resource, must be reassessed. In making such a reassessment, planners, investors and decision-makers must see incentives in their political economy paradigms. For some countries, the incentive may be to align with international law and standards. Other countries may address the problem through water pricing and markets, while in others, economic diversification and growth may reduce the relative size of the agriculture sector, commensurately reducing the scale of its water allocations and meeting food requirements through trade. Most important, efforts to increase water efficiency and productivity in the agricultural sector must be enhanced to lower vulnerability to water scarcity. The Sudanese case provides further insight on how cooperative management and development of

Figure 2.14 **Public spending on water in selected Arab countries**



Source: World Bank 2007.

Box 2.10 Water governance in the State of Palestine

Water resources in the State of Palestine consist primarily of surface water and groundwater resources. The major, permanent surface water resource is the Jordan River, an international watercourse shared between Israel, Jordan, Lebanon, the State of Palestine and the Syria. But as the Palestinians were deprived by the Israelis of their rightful share of the Jordan River, groundwater resources have become the major source of fresh water. In the West Bank, groundwater is located in three major drainage aquifers: the Western Aquifer, the Northeastern Aquifer and the Eastern Aquifer. Although no water quality database exists, individual studies and monitoring projects indicate severe contamination and water quality problems in all major aquifers.

Under the Oslo II Agreement, Israel and the State of Palestine agreed to coordinate the management of water and sewage resources and systems in the West Bank through the Joint Water Committee (JWC), a bilateral committee established by the Oslo Accords to manage water resources in the West Bank and Gaza during the interim period. The JWC process disrupts sound planning of West Bank water resources, as water resource management plans cannot effectively be implemented because of restrictions imposed by Israel on accessing critical well fields.

After the 1967 War Israel took control of water resources and developed wells throughout the West Bank and a water supply network linked to the national Israeli water companies' (Mekorot and Tahal) network. In 1995 the Oslo II agreement (Article 40) contained provisions on water and sewage that recognized undefined Palestinian water rights and returned some West Bank water resource and service responsibility to the PA.

Israel has violated Palestinian water rights in the Jordan River since 1967. In the early 1950s the Jordan River had an annual water flow of 1.25 billion cubic metres a year. But as a result of the river water's diversion from Lake Tiberias to the Negev desert through the Israeli National Water Carrier, as well as other regional projects, the river is currently running with high salinity and deteriorated quality at a flow of 200 million cubic metres. The Israelis have also been discharging wastewater and diverting brackish spring water into the river, contaminating the river water along the West Bank. The Israelis are currently using about 82 per cent of the annual safe yield of the groundwater basins to meet 25 per cent of their water needs, whereas the water consumption of Palestinians residing in the West Bank constitutes around 17 per cent of the annual safe yield.

Israel has also actively prevented the construction and maintenance of water and sanitation infrastructure in the West Bank by exercising its veto through the Joint Water Committee, which is mandated to approve all water and sanitation projects in the West Bank.

In the West Bank, Mekerot distributes 110 million cubic metres a year to 1.5 million Palestinians and 30 million cubic metres to 140,000 Israeli colonists, whereas 460 million cubic metres are deviated to Israel. Typically poor, utility performance is deteriorating, with unaccounted-for water averaging 34 per cent and bill collection rates averaging only 50 per cent. Water service providers are not doing their best to collect water bills. The prevailing social, economic and political conditions in the State of Palestine have also resulted in many public groups either refusing or being unable to pay their water bills to the service providers.

The performance of the Jerusalem Water Undertaking, a district utility serving Ramallah-El Bireh area and belt communities east of Jerusalem, shows that under the right conditions, Palestinian operators can be efficient. For most other utilities, water scarcity, run-down infrastructure, security problems and lack of institutional autonomy and capacity, combined with an impoverished and resentful customer base, have led to very poor services and financial difficulties. Increasing dependence on Mekorot by the water supply utilities makes them vulnerable to Israeli decisions and interventions and may increase commercial risks and costs. There is a strong need for integrated planning for water resources and services at the local level.

The policies and practices outlined above have restricted the Palestinian authorities' ability to provide adequate service to the Palestinian population and in some cases prevented humanitarian organizations from providing aid and assistance to vulnerable communities. As an occupying power, Israel is primarily responsible for the welfare of the Palestinian population in the West Bank and obligated to facilitate the work of the Palestinian authorities in areas they are responsible for, including water and sanitation provision.

The Palestinian Water Authority (PWA) cannot conduct any integrated management for water resources in the West Bank within the current governance framework. The governance system established by Article 40 (Oslo II) requires approval by Israeli authorities of any proposed project within the West Bank. This arrangement and its implementation give Israeli authorities control over allocating and managing West Bank water resources. Israeli territorial jurisdiction in Area C (60 per cent of the West Bank) consolidates this control, which makes integrated planning and management of water resources virtually impossible for the Palestinian Authority. Despite growing demand from Palestinian consumers, the Israeli Water Authority has used its regulatory role to prevent Palestinian drilling in the Western Aquifer, while increasing its own extraction from the aquifer above agreed levels.

The JWC has not fulfilled its role in providing an effective collaborative governance framework for joint resource management and investment. Unfortunately, it does not function as a joint water resource governance institution because of fundamental asymmetries of power, capacity, information and interests. These asymmetries prevent a consensual approach to resolving water management conflicts and have reduced the development of water

resources and services for Palestinian people below the levels expected at Oslo.

Water law provides for sector governance, including separation of resource management and regulation from resource use. But this vision is not reflected in present organizational arrangements. The National Water Council has never functioned as intended; PWA operates both as regulator and implementer, and water supply service remains in the hands of several hundred separate municipal water departments and local councils. PWA, not performing to expectations, has lost capacity because of governance and management problems. One yardstick of institutional capability is PWA's weak ability to negotiate effectively in the JWC.

Integrated water resources management is impossible under current conditions. The solution for all these problems will require political movement. Reforming the way the JWC and Civil Administration address Palestinian development needs is a priority until the political issues are finally resolved.

Source: Mimi and Samhan 2011, background paper for the report; ADA and ADC 2007; Isaac 2004; PWA 2009; World Bank 2009b.

shared water resources could create a win-win situation for riparian countries (Box 2.8).

Inadequate governance of shared water resources continues to threaten the region's stability and food security and impose high levels of uncertainty on water resource planning in the downstream countries. Despite the existence of several operational agreements governing Arab shared water resources, the increasing pressures on water and the deterioration of its quality require a basinwide water management framework ensuring an integrated and sustainable development of those resources (Box 2.9).[68]

Occupation and water governance

Deprivation of water resources in occupied territories is a major issue. The State of Palestine provides an example (Box 2.10). International conventions state that it is illegitimate for military occupiers to exploit and invest in natural resources within occupied territories while denying the state owning these resources the right to such investment. However, Israeli practices in occupied Palestine and the Syrian Golan heights violate these international conventions. Israel's military chief declared after the 1967 war that all West Bank water resources belonged to Israel. Palestinian waters were placed under the direct control of Tsahal (the Israeli Army) and the management of the Israeli government through the Water Delegation Office. In 1967–1968, several military orders were issued establishing the occupation's authority over all water exploration and well-drilling works. Military decision number 158 forbids Palestinians from owning a hydraulic system or drilling a well without a permit from Tsahal. Even with a permit, they cannot exceed 60 metres in depth, whereas settlers can reach depths ranging between 500 and 600 metres.[69] Israel now illegally exploits almost 85 per cent of West Bank water resources and continues to prohibit the Arab population from drilling new wells.

Funding

The Arab region's chronic water problems entail high investment needs and growing costs to maintain, develop and expand water and sanitation coverage to achieve the water-related MDGs. The water sector, predominantly publicly owned with little private sector involvement, has a funding gap. Water investments absorb large amounts of public funds that could be used more efficiently elsewhere, without generating optimum economic returns.

The Arab region has a fairly large public sector and a major share of central government budget in public funds. Across the region, significant public resources are invested in the water sector. Government spending on the water sector in the Arab countries varies between 1.7 per cent and 3.6 per cent of GDP (Figure 2.14). During the last decade, water represented between 20 per cent and 30 per cent of government expenditures in Algeria, Egypt and Yemen.[71] But these values are lower than the optimal annual investment needed between 2005 and 2010, estimated at about 4.5 per cent of GDP for the MENA region.[72] The Islamic

Box 2.11 Reducing water losses by combining a management contract with rehabilitation work in Amman, Jordan

The management contract in Amman illustrates the difficulty of assessing a private operator's contribution. The public-private partnership was one element of a major investment project (valued at about $200 million) to rehabilitate Amman's water distribution network. The plan was to move from a poorly designed hydraulic system to one with well-delineated zones gravity-fed through reservoirs. The management contract was supposed to ensure that an experienced operator would handle this structural change smoothly, reducing service disruptions and maximizing operational benefits from the new infrastructure.

Because of acute water rationing in the city, customers received water for less than four hours a day on average. Reducing water loss was a top priority, but it depended both on the government's rehabilitation programme and on the private operator's improvements. The original drafting of the contract did not clearly acknowledge these dual responsibilities. In addition, ambitious targets were imposed on the operator, backed by swift financial penalties: the nonrevenue water level was to be reduced by 10 per cent in the first year of operation, up to 25 per cent (halving the nonrevenue water level) by the end of the fourth.

Difficulties developed early on, as the government agency in charge of implementing the civil works experienced major contract delays. Further delays arose during execution because of the complexity of coordinating many contractors. After tense discussions in the first two years, it was recognized that the private operator could not be held liable for failing to meet the contractual nonrevenue water targets and that the targets had been overestimated. A special project monitoring unit was also set up to help the government better play its role as counterpart in the partnership.

As the programme proceeded, another problem arose: with the gradual reduction in water rationing, the increase in average network pressure caused a spike in the number of water leaks. The operator had to repair 55,000 leaks in 2004. By the end of the contract, it had replaced about 600 kilometres of pipe, close to 10 per cent of the network. The management contract was extended twice to keep the private operator in place until the end of the capital expenditure programme in 2006. By the end of the contract, nonrevenue water had been reduced from 51 to 42 per cent—a notable improvement, though far below the original target. At the same time, the average number of hours of service was doubled.

This case holds important lessons. Though the parties finally agreed that the original nonrevenue water target of 25 per cent was unrealistic, their protracted negotiations on this subject distracted them from focusing on more productive tasks. Tracking the operator's performance was made difficult by the operator's dependence on the government's timely execution of the investment programme. Finally, the network's hydraulics were being profoundly altered, so the reference point for measuring leaks was constantly changing. Using the nonrevenue water percentage as the sole contractual indicator of the operator's performance to track water losses and impose stiff financial penalties was thus a mistake.

Source: Marin 2009; El-Nasser 2007.

Development Bank (IDB) estimates that Arab countries may need to invest up to $200 billion in water-related infrastructure over the next ten years to satisfy the growing demand.[73] For these large amounts of required water investment funds, issues of accountability, transparency, democracy in decision-making and other governance factors must be tackled.

In Saudi Arabia the capital expenditure for infrastructure development projects in the water sector is about $40 billion for the next 20 years. Water distribution will represent 38 per cent of spending, while sewage collection and water treatment will account for the remaining 62 per cent. More than $20 billion has been earmarked as investments to be spent mainly on water and wastewater projects in six major cities—Dammam, Jeddah, Madinah, Makkah, Riyadh and Taif—over the next 10 years.[74] The Saudi National Water Company (NWC) is planning to invest $23 billion in Saudi Arabia's sewage collection and treatment infrastructure over the two coming decades. This investment aims to increase wastewater network coverage to 100 per cent, up from the current coverage level of 45 per cent (and lower in some cities/towns).[75]

Planned investments in water desalination are huge, particularly in the Gulf Cooperation Council countries. In 2003 the construction cost of desalination plants installed in those countries was about $21 billion.[76] Between 2011 and 2020, Saudi Arabia is expected to invest around $53 billion to increase production

from desalinated sources by 3.92 billion cubic metres. The United Arab Emirates may invest $10 billion during the same period. Egypt, the Gulf Cooperation Council, Iraq, Jordan, Lebanon, the State of Palestine, Syria and Yemen may need more than $30 billion in investments in water supply and sanitation facilities up to 2015.[77] In Kuwait investments in desalination facilities are estimated at $7 billion up to 2025.

While most oil-producing countries in the Gulf Cooperation Council can afford water source solutions such as desalination, many other Arab countries suffer from these solutions' heavy financial burden. Jordan's water strategy for 2009–2022 was to invest Jordanian Dinars 5.86 billion ($8.24 billion) over 15 years, corresponding to more than 160 per cent of Jordan's GDP.[202]

In the Gulf countries, all investment for water and sanitation, including desalination, is funded directly by the central government. The eighth Saudi development plans covering 2006–2010 allocated for water (including irrigation) Saudi Riyal 41.6 billion ($11.1 billion), equivalent to around $2 billion per year. Many Arab countries depend, however, on external public donors for water supply and sanitation. The main external donors to the region are the European Union, Germany, Japan and the United States. Other donors include the United Nations (UN), the World Bank, the Islamic Development Bank (IDB), the Kuwait Fund for Arab Economic Development, the Saudi Fund for Development, the Abu Dhabi Fund and the Arab Fund for Economic and Social Development.[79] The size and share of external funding vary among the region's countries—some depend on external funding completely. Most investments in the Jordanian and Lebanese water and sanitation sector, for example, are financed through grants and loans from external public donors. Other funding mechanisms involve private sources through Build-Operate Transfer (BOT) projects. The BOT for the Disi-Amman carrier will be partially financed with around $190 million of private equity security. The government will secure a grant of $300 million, and loans totalling $475 million will be provided.[80]

Financial considerations, including revenue from the sale of assets and reductions in the direct cost of providing water services, may also motivate governments to introduce private sector participation. In countries where water technically belongs to the government, private interests may often access the water or lease rights for various purposes. Barriers and risk factors to private sector participation include low returns; asymmetry of information; technology-specific, inelastic demand; and capital-intensive, high fixed-cost, long-term investments.[81] Water and sanitation responsibilities are also split between ministries and among national and local authorities.

Privatization: positives and negatives

To achieve full cost recovery and improve economic efficiency, and under pressure from international donors, many Arab states have endorsed privatization through direct sales of assets, such as water supply and distribution systems and wastewater treatment plants, to private sector entities. But privatization is controversial. It allows the government to secure money and enhance the efficiency of local water service markets by reducing prices and satisfying customers with better service. According to privatization proponents, water pricing according to market forces will determine water's real price and force water users to adjust their consumption and constrain wastefulness. Private corporations can also better manage and distribute water because of their efficient management structure, access to cutting-edge technology, ability to recover the full cost of distribution and capacity to eliminate market distortion and subsidies.[82] Privatization thus prevents bureaucratic costs and limits political corruption.

On the other hand, many argue that water privatization will create new barriers to common resources and deprive vulnerable groups, especially poor people, of their basic water needs or rights, leading to inequitable distribution. A small group of capital owners will exploit a public good without regard for environmental consequences or concerns. Privatization can also reduce local control over natural resource management and negate years of positive development. Considering water private property

creates the possibility of "excluding others from access" to a life-sustaining element.[83] Moral and social debates on water ownership and the negative implications of water commoditization are usually neglected. Empirical analysis results also show that demand-price and income-price are inelastic. So if a user-fee policy were adopted, tariff increases would affect disadvantaged groups' income but would not decrease their consumption. Large price increases would only be required in urgent situations to eliminate short-run shortages.[84] Non-price-based policies, such as technological change and improving water bills' informational content, could make price systems more effective and promote conservation, taking into consideration social and geographical features.

Water supply privatization contracts were implemented in Gaza, Jordan, Lebanon, Qatar and Yemen and seriously considered in Bahrain, Egypt, Kuwait and Saudi Arabia.[85] Water resource privatization is practiced in the region on a small-scale, individual level: private well owners sell water to private vendors and tankers for rural areas and parts of cities, either as a primary or supplementary water source. Without adequate infrastructure and regulatory frameworks, such off-network practices are often informal and characterized by hazardous source extraction.

Jordan, Lebanon and Yemen have implemented legislative and institutional reforms to pave the way for the privatization of water and sanitation services and counter the negative impacts of increasing water demand, such as overexploitation of groundwater resources. In the Emirate of Abu Dhabi, the first privatized project, Al-Taweelah A2 Desalination Plant, decreased the cost of desalinated water production by about 40 per cent, reducing the water tariff by the same amount and reducing government subsidies.[86]

However, water privatization problems persist. Non-transparent privatization plans and the lack of expertise in privatization planning and implementation have led to marginalization of local communities and the spread of public distrust and resistance. Governments are usually accused of selling off public assets at low prices and giving control of vital resources to the private sector.

Arab states could derive greater benefits from privatization by conducting dialogue with stakeholders, taking into consideration socio-economic needs and respecting water as a human right. In parallel, the preparatory privatization steps, including utility selection, contract negotiations, monitoring of the bidding process or the performance of private investors, need institutional and regulatory framework reform to ensure full coordination and consultation among various ministries and water institutions, as well as civil society structures.[87]

Public-private partnership

Public-private partnerships were introduced to the Arab region to enhance the performance of public water and wastewater utilities, expand and improve service coverage, provide alternative mechanisms to finance infrastructure investment and reduce the burden on government budgets. A wide range of approaches are available for involving the private sector, including service delivery (such as distribution, billing, monitoring and leak detection) and managing, operating and financing water and sanitation projects. Some options keep operations (and ownership) in public hands but involve the private sector in designing and building infrastructure.

The government's regulatory role in protecting the consumer from monopoly, overpricing and service quality degradation affects the success of such a partnership. Public control of water tariffs, along with sufficient capital investments, would make water affordable. On the other hand, a private entity will not achieve management efficiency if the government frequently intervenes in its operations. Also, it would not work for a loss or little profit. Thus, government regulations have to take into consideration the concerns of the investor, the contractor and the public. A regulatory framework is necessary but not sufficient for effective government regulation; effective implementation is required.[88]

In the Arab region, the urban population served by private operators is fairly small, with 7 million people in 2000 rising to 13 million people in 2007. Between 1990 and 2005 public-private partnerships in Morocco took

the form of concessions in several cities and installed 270,000 new water connections, providing piped water access to about 1.3 million people and reducing nonrevenue water. The financial design of the Casablanca concession helped support access expansion. A special work fund, financed by a 0.5 per cent tariff surcharge, provided $140 million of the $500 million of civil works that the concessionaire carried out over a decade. Another major funding source has been a connection fee for all water utilities (public or private) well above the connection cost, although this fee did not meet targets for coverage expansion, mainly because of high connection fees and difficulties in dealing with illegal settlements.[89] An assessment of the public-private partnerships revealed, however, that water access and coverage grew only about 6 per cent in four Moroccan cities, while the publicly managed utilities registered growth of 9 per cent for the same period. Involving private operators in water utility management in Jordan and the West Bank and Gaza reduced nonrevenue water and improved bill collection through strict policies, education campaigns and close cooperation between public and private operators (Box 2.11).

The impact of public-private partnerships on expanding water coverage is not very significant. Whether public or private, water utility performance depends on more than funding mechanisms. Private sector participation should focus on improving operation efficiency and service quality through an inclusive partnership with the public sector, rather than just attracting private funding.

Improper water valuation

Comprehending water's value is vital for policy decision-making about water sector investments to ensure proper allocation and achieve economic efficiency. Social, cultural, environmental and religious issues of water as a human right must be kept in mind. The water sector tends to be capital-intensive, as service requires large infrastructure investments and fixed and sunk costs. Attributing investments, costs and benefits to water services helps manage these services economically, allowing all parties to charge the beneficiaries to cover the costs of their specific water service.

While most Arab countries are implementing water management strategies, they typically disregard or underestimate water's economic value, instead focusing on financial costs and feasibilities to recover the costs of providing water for various sectors. Many countries, such as Lebanon, subsidize agricultural, domestic and industrial water use. In the agriculture sector, water's economic value is often not considered and is set at a minimal cost despite overconsumption.[90]

Understanding, appreciating and properly establishing water's real value including environmental and social as well as operational and construction costs is essential to effective water governance.

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