



The environment, resource pressures and human security in the Arab countries

The relationship between resource pressures, environmental sustainability and human security is a matter of utmost importance

In this chapter, the authors illustrate that the relationship between resource pressures, environmental sustainability and human security in the Arab countries is a matter of utmost importance. Oil, the resource most commonly associated with the region, has generated untold riches and power for some yet disempowered many more and left entire societies vulnerable to geopolitics. Despite this source of wealth, the region will increasingly face tremendous challenges to the security of its population, in terms of physical survival and access to jobs, income, food and health services. Potential conflicts originating in competition for dwindling natural resources may heavily strain relations among communities, populations and states, Arab or non-Arab. These challenges will result from population and demographic pressures, the overexploitation of land, water shortages, desertification, pollution and climate change. Such threats may appear less formidable than those examined in other chapters yet their effects are often irrevocable, more damaging and more extensive. Thus, they constitute an appropriate starting point in the report's analysis.

A mixed endowment

The natural environment of the Arab countries is both a blessing and a curse

The natural environment of the Arab countries is both a blessing and a curse. It is a blessing because the region's location and natural endowments enabled it to play a leading role in past civilisations: enabled the three religions that arose there to spread throughout the world; and enabled the Arab peoples to establish contact with, learn from, and enrich other civilisations. This environment also includes some of the world's largest known oil reserves whose exploitation has facilitated an extraordinary transfer of wealth to certain

Arab societies, especially the Gulf States, that has affected every aspect of material, social and cultural life. However, while this environment still offers theoretically extensive prospects for Arab human development, should Arabs interact with it more prudently, it is also in some respects a curse. This same environment suffers critical water deficits and is largely arid. It is subject to population pressures, the over-exploitation of resources and rapid urbanization, which contribute to its degradation.

The most significant challenges

Environmental threats include water shortages, desertification, pollution and climate change

The following review treats the most important environmental threats in the Arab countries. It considers population and demographic pressures as a major cross-cutting issue present in each area of threat. These threats include, water shortages, desertification, pollution, and climate change. A key aspect to these environmental threats is the dynamic, interactive relationship among them. Water shortages, for example, contribute to desertification, while climate change may lead to floods in some areas and to worsened water shortages, drought and desertification in others. Similarly, air pollution is an underlying cause of climate change.

Population pressures and demographic trends

For most of the latter half of the 20th century, the Arab countries had one of the highest population growth rates in the world.¹ From 1975-1980, the total fertility rate (TFR) of the region was 6.5, meaning that the average Arab woman living to the end of her childbearing years would give birth to six or seven children. This rate declined to 3.6 in 2000-2005, a rate that is still higher than the population replacement rate of 2.1. Such a high TFR has contributed to a high population growth rate, although declining from 3.2 per cent per year for 1970-1975 to 2.1 per cent per year for 2000-2005. For the period 2005-

Box 2-1

MOSTAFA KAMAL TOLBA* – Core environmental challenges in the region

We have entered the 21st century facing most of the high-priority environmental challenges that confronted us in the latter half of the twentieth century, with only differences of intensity and priority. These include: water shortages and deteriorating water quality, land constraints, desertification, the environmental effect of increasing energy production and consumption, the pollution of coastal areas, forest loss, unwise consumption of natural resources, deteriorating urban environments, and the spread of pollution resulting from dangerous solid and liquid wastes.

A new problem which has emerged is the lack of rigour in the use of modern economic tools such as environment-based and natural wealth-based economics and accounting. To this we must add the acute negative effects of global environmental problems, foremost among them climate change and global warming.

Water scarcity, a problem exacerbated by the spread of water pollution, remains one of the most significant challenges to the Arab countries. It calls for concentrated effort in the absence of ideal methods for regulating the use of surface, ground and river water, increasing the economic return yielded per unit of water used, and overcoming the problem of decentralized responsibility for the implementation of water and land management policies. Because this responsibility is divided among a large number of institutions and ministries, it is essential to establish an autonomous institutional entity with sole responsibility for water resource management. Only such an institution can achieve the ideal balance between supply and demand on a sound socio-economic basis. In addition, serious work needs to be done to localize water desalination technology in the region, particularly for the local production of reverse osmosis membranes, and to develop means of using solar energy in the desalination process.

Still another challenge for us is a shortage of land resources, in that 54.8 per cent of the region's total area is considered 'empty'. Pastureland makes up 26.8 per cent, arable land 14.5 per cent, forests approximately 3.9 per cent, and cultivated land approximately 29 per cent of all arable land, or approximately 4.2 per cent of the Arab region's total land area. The Arab countries' forests, more than 80 per cent of which are located in Sudan, Algeria, and Morocco, cover approximately 3.9 per cent of its total land area. These forests are being subjected to increasing pressures, and are being lost at an annual rate of 1.59 per cent. At the same time, economic activity is increasing in coastal areas in the region, particularly urban and industrial expansion. Consequently, seacoast areas in Arab states, which are inhabited by 40 to 50 per cent of their populations, are being threatened by pollution from petroleum and heavy elements.

In terms of climate change, the Arab region's share of greenhouse gas emissions is still negligible, although per capita emissions are rising, especially in crowded cities. Inevitably, however, Arab states will suffer numerous negative consequences resulting from climate change.

These environmental issues can only be confronted through scientific research and serious technological development. Moreover, no one Arab state alone can undertake these tasks single-handedly. A serious beginning thus needs to be made on creating networks of specialized research centres in these critical areas for the purpose of distributing roles and sharing expertise in order to develop a menu of alternative solutions from which decision makers in the various Arab states may choose.

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2010, the population of the Arab region is projected to grow by 2.0 per cent per year, and, over 2010-2015, the projection is 1.9 per cent per year. This is nearly double the world average for these periods, 1.2 per cent and 1.1 per cent, respectively.² Taking into account existing population momentum, the UN estimates that the Arab countries will be home to some 385 million people by 2015 (compared to about

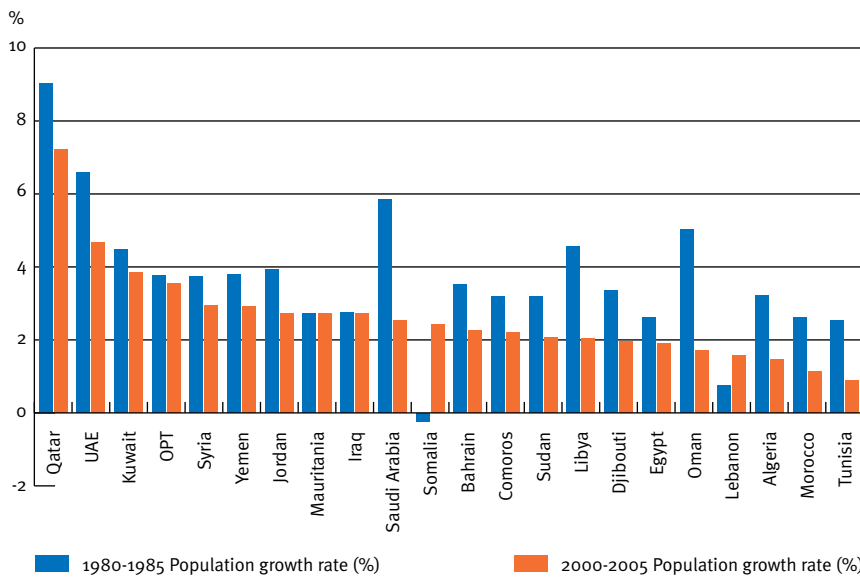
331 million in 2007, and 172 million in 1980).³ In a region where water and arable land are increasingly very scarce, population growth at these rates will still put intense pressures on the carrying capacity of Arab lands and further threaten environmental sustainability.

With more mouths to feed, countries that have come to depend on food imports as a result of water shortages and

UN estimates indicate the Arab countries will be home to some 385 million people by 2015

Figure 2-1a

Average annual population growth rates have declined for most Arab countries since the 1980s

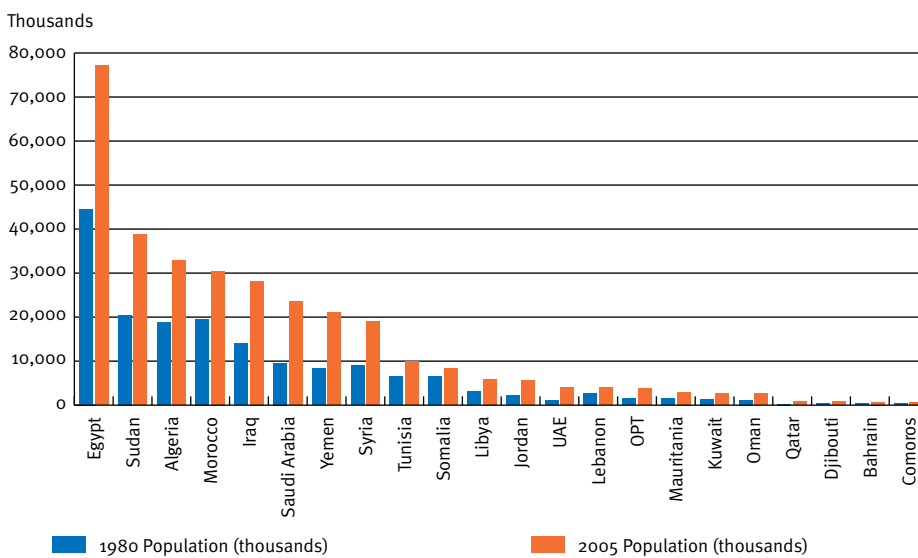


Source: United Nations Population Division 2008.

Population growth at these rates will still put intense pressure on the carrying capacity of Arab lands

Figure 2-1b

But the population build-up continues



Source: United Nations Population Division 2008.

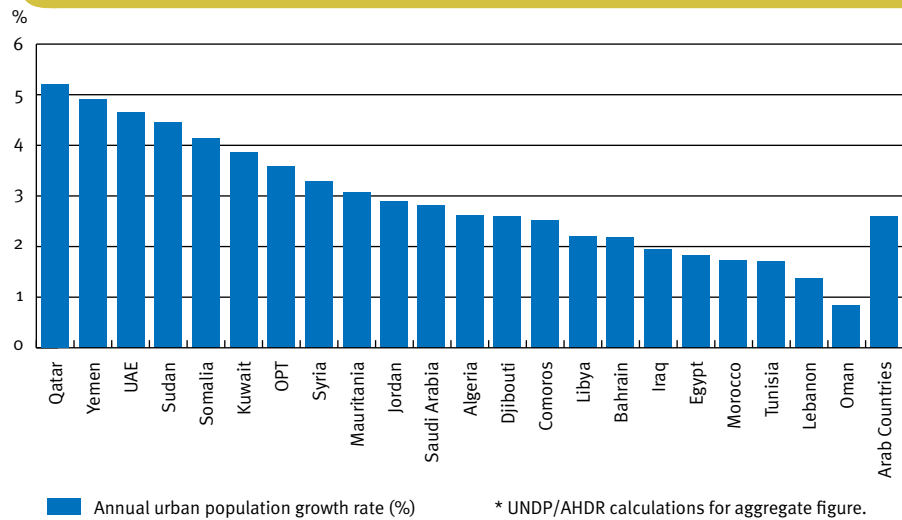
Some 60 per cent of the Arab population is under 25 years

spreading urbanization will find their trade balances and economic growth options increasingly affected. The growth of Arab cities and towns poses particular challenges. Accelerating urban drift in the region is straining already-overstretched infrastructure and creating overcrowded, unhealthy and insecure living conditions in many cities. In 1970, 38 per cent of the Arab population was urban. By 2005 this had grown to 55 per cent, and it is likely to surpass 60 per cent by 2020.⁴

The most evident and challenging aspect of the region's demographic profile is its 'youth bulge'. Young people are the fastest growing segment of Arab populations. Some 60 per cent of the population is under 25 years, making this one of the most youthful regions in the world, with a median age of 22 years compared to a global average of 28.⁵ Young people consume resources and require large investments before they become economically productive. They also represent

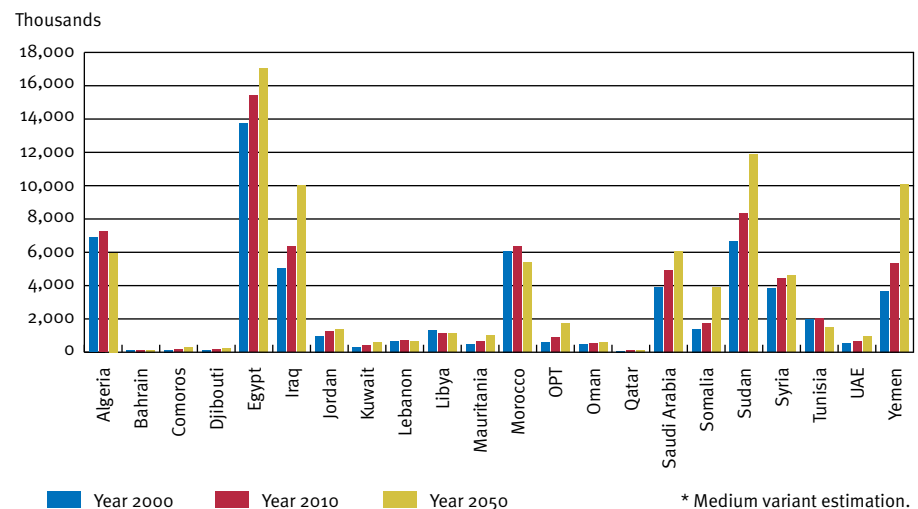
Coming generations have a right to an environmental inheritance that has not been overdrawn or mismanaged

Figure 2-2 Average annual urban population growth rates (%) by country, 2000-2005*



Source: United Nations Population Division 2006, 2007.

Figure 2-3 Projected Arab population aged 15-24 up to 2050*



Source: United Nations Population Division 2008.

coming generations with the right to an environmental inheritance that has not been overdrawn or mismanaged by their predecessors.

Water scarcity

Arab countries suffer from a scarcity of water resources because most of them are in arid or semi-arid regions. The situation is becoming more severe owing to the continual increase in withdrawal under pressure of demographic and economic growth. Permanent rivers are the main source of surface water in the Arab countries, followed by springs, riverbeds, and seasonal rivers.

Total available water in the Arab countries is estimated at 300 billion cubic meters per year.⁶ Total available surface water resources in the Arab countries are estimated at 277 billion cubic meters per year,⁷ only 43 per cent of which originates within the Arab countries, the rest elsewhere. External surface water resources shared with neighbouring countries outside the region account for approximately 57 per cent of the total available surface water in the region.

The major international rivers in the region are shared between countries lying both within and beyond the region, and include the following: the Tigris and the Euphrates, both shared by Iraq, Syria and Turkey; the Orontes (or Assi), shared by Lebanon, Syria and Turkey; the Jordan (including the Yarmouk), shared by Jordan, OPT, Israel and Syria; and the Nile, with nine riparian parties of which only Sudan and Egypt are Arab countries. Years of effort have yielded the establishment of formal agreements (such as the Nile Basin Initiative) on the management of shared water resources. However, most are partial, ineffective and inequitable in terms of the full spectrum of riparian rights. At the regional and interregional levels, cooperation on water usage and management is heavily affected by prevailing political tensions and ongoing conflicts. Tensions have emerged on sharing resources as the needs of the riparian countries are increasing.⁸

Underground water reserves in the Arab countries are estimated at 7,734 billion cubic metres, while the amount of water being fed into these reserves is estimated

Box 2-2

Sharing the source of life

The Middle East and North Africa are regions plagued not only by lack of water but also by ancient political tensions. While action and cooperation among the states are necessary in sectors other than water and the environment, water stands to become a tool which can enhance peaceful relations between the parties. It is essential to reduce the demand for water by managing population size, enacting conservation measures, promoting awareness and adopting water-saving technologies and pricing techniques, especially in agriculture. The private sector, non-governmental organizations, international agencies and national agencies can play a major part both as investors and as managers. In fact, it is the common responsibility of all actors of society: businesses, governments, scholars, researchers and individuals, to contribute to the elaboration of numerous solutions.

Source: Karyabwite 2000.

at no more than 42 billion cubic metres annually over the various regions; that available for use is no more than 35 billion cubic metres annually. The greatest and most abundant renewable reserve in the Arab countries is in North and East Africa (Algeria, Egypt, Libya, Morocco, Somalia, Sudan, and Tunisia).⁹

Aquifers are groundwater systems that are often the only source of fresh water, particularly in regions with arid and semi-arid climatic conditions (as in some Arab countries), and represent a vital guarantee of both national and regional water security. At the regional level, some cross-national groundwater aquifers are renewable, including the aquifers underlying the border areas between Syria and Turkey; Israel and Lebanon; Jordan and Syria; Iraq and Syria; and Israel and the West Bank. Others are non-renewable aquifers containing fossil water, including the Nubian sandstone aquifer underlying Chad, Egypt and Libya; the basalt aquifer underlying Jordan and Saudi Arabia; and that underlying the Arabian Peninsula shared by Iraq, Jordan and Syria. Additional deep non-renewable aquifers underlie Iraq, Kuwait and Saudi Arabia; Jordan and Iraq; and Iraq and Syria. Although the water in some of these aquifers is partially sufficient to meet freshwater demand, the quality varies greatly owing to the level of salinity in the shallow renewable aquifers, and in the case of deep non-renewable aquifers, due to the variation in amounts of total dissolved solids (TDS).

Water scarcity is becoming more severe

Tensions have emerged on sharing resources as the needs of the riparian countries are increasing

Box 2-3

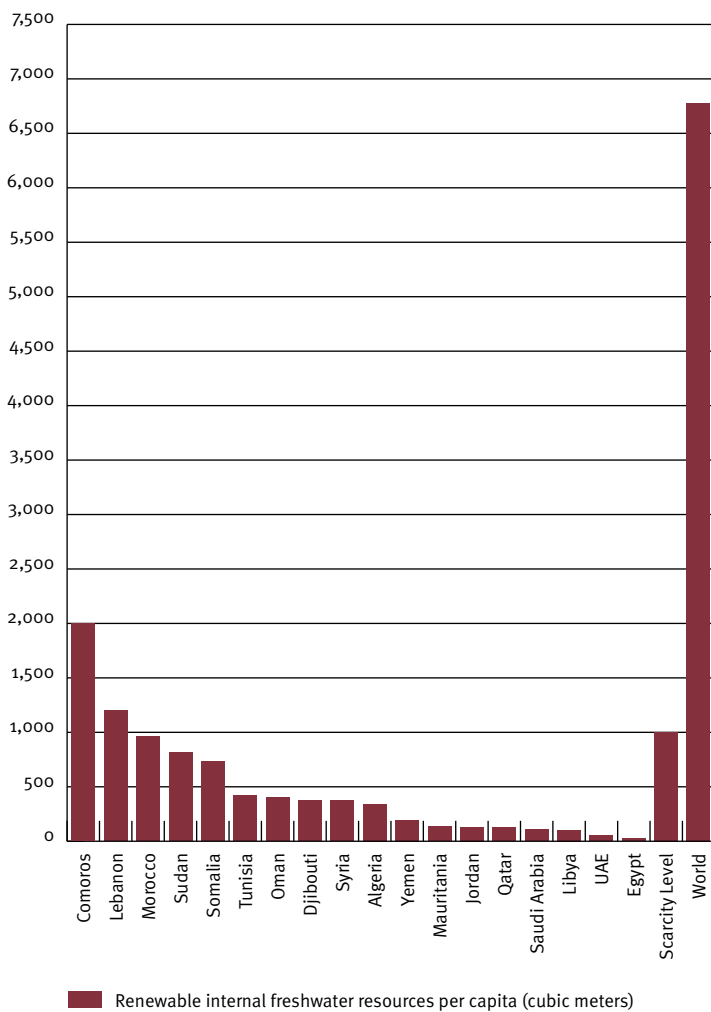
The cost of non-cooperation over transboundary water sources

As water becomes scarce relative to demand, transboundary competition for shared rivers and other water resources will grow. Without institutional mechanisms to respond to these transboundary problems, competition has the potential to lead to disruptive conflicts. The spectre of growing competition for water between states has generated a sometimes polarized public debate. Some predict a future of “water wars” as states assert rival claims to water. Others point out that there have been no wars over water since an event some 4,000 years ago in what is now southern Iraq—and that countries have usually responded to transboundary water competition through cooperation rather than conflict. From this more optimistic perspective, rising competition is seen as a catalyst for deeper cooperation in the future... water has the potential to fuel wider conflicts but also to act as a bridge for cooperation.

Source: UNDP 2006b.

Figure 2-4

Arab internal freshwater resources are often below scarcity levels and the world average, 2005



Source: World Bank 2008.

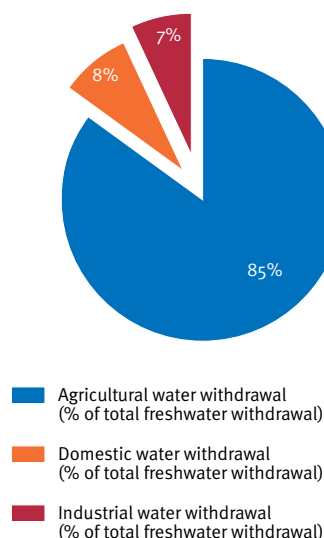
On the transboundary level, any disruption of the aquifer in any of these countries can have a damaging impact on the groundwater resources in the adjacent countries in terms of quantity and/or quality of water. These transboundary implications may not be immediately apparent, but may nevertheless be very hard to reverse. Over-pumping from groundwater reserves is often carried out to meet the demands of population growth, agricultural development and industrial needs. This harms the future viability and productivity of the aquifers and, in coastal areas, may result in the intrusion of sea-water into the aquifer as a consequence of the formation of large cones of depression. Poor distribution and heavy demand, especially of ground resources, characterize water use in the Arab countries. This leads to a lack of clean water for much of the population and the waste of significant amounts in the agriculture, industry and tourism sectors.¹⁰

Many sources refer to the dimensions of the water crisis in the region. The Joint Arab Economic Report (JAER)¹¹ of 2001 confirmed that the region had actually entered a stage of water poverty that, at the time, was the worst in the world based on available per capita renewable water resources. The report estimated these resources at 265 billion cubic metres, or approximately 1,000 cubic metres per capita. The worldwide per capita share was seven times that. The report stated that an increasing population’s demand for water would reduce per capita share to 460 cubic metres by 2025, lower than the extreme water poverty level according to international classifications. What is even more worrying is that these rates would be accurate if these amounts of water were usable. However, much of the water is located far from areas of consumption, making container and transportation costs economically impractical either for drinking or for agricultural and industrial uses.

The global HDR 2006 confirms this, pointing to the ballooning of the water problem in Arab countries with the reduction of average water availability by more than one-fourth.¹² That report agrees with the JAER that per capita share in the Arab countries will drop by almost 500 cubic metres, while more than 90 per cent of

Figure 2-5

Use of withdrawn water in Arab countries (%) by sector, 1999-2006*



* Latest values available for all 22 Arab countries.

Source: UNDP/AHDR calculations based on FAO, AQUASTAT database 2009.

the population will be in countries suffering from a water shortage. The same report stated that while the water deficit lessened relatively quickly from 1990 to 2004 in other parts of the world, the rate of reduction was the slowest in the Arab countries. In the foreseeable future, much of the population of the region will suffer from water stress, obtaining less than 1,700 cubic metres of water annually, while many others will experience a water shortage, receiving less than 1,000 cubic metres annually.¹³

A report from the UN Economic and Social Commission for Western Asia (UN-ESCWA)¹⁴ applies the question of water stress to that national level in the Arab states.¹⁵ It distinguishes between four levels of water stress as gauged by the ratio of population to renewable freshwater—slight, significant, serious and critical. As shown in Table 2.1, the study shows that four countries are facing “slight” water stress, two are facing “significant” water stress, five are facing “serious” water stress, and two – Kuwait and the UAE – are facing “critical” water stress.

Table 2-1

Levels of water stress in thirteen Arab countries, 2006

Critical water stress (More than 10,000 persons per million cubic metres)	Serious water stress (Between 5,000 and 10,000 persons per million cubic metres)	Significant water stress (Between 2,500 and 5,000 persons per million cubic metres)	Slight water stress (Less than 2,500 persons per million cubic metres)
Kuwait	Bahrain	Jordan	Egypt
UAE	Iraq	Saudi Arabia	Lebanon
	Occupied Palestinian Territory		Oman
	Qatar		Syria
	Yemen		

Source: UN-ESCWA 2007.

Alleviating water scarcity

Arab governments have certainly exerted great efforts to supply drinking water and water for economic uses to their citizens. As a result of such efforts, coverage of water needs of the Arab people increased from 83 per cent in 1990 to 85 per cent in 2004, bearing in mind that this population increased from 180.1 million to 231.8 million during the same period.¹⁶ Although there is no magical cure for the increasingly grave problem of water scarcity in the Arab countries, studies give some broad outlines of the steps that can be taken to minimise the potential threat. These include:¹⁷

1. Optimization of water allocation among the three domains (agricultural, industrial, domestic).
2. Implementation of an optimal water productivity strategy that leads to the import of water through virtual water.¹⁸
3. Holistic and integrated approaches to water resources supply and demand planning and management.
4. Capacity building and technical upgrading of all stakeholders.
5. Awareness-raising at all levels, from end-users to decision-makers.
6. Issuing and implementing sustainable water policies based on the above points and on current and prospective water data and research.
7. Development of water resources management models that can simulate different solution scenarios to select the optimal approach.

Much of the population of the region will suffer from water stress, and many others will experience a water shortage

Steps can be taken to minimise the potential threats

Desertification is a peril in the region

The creeping desert

Across the various geological epochs, the climate of the Arab countries has fluctuated between dry and humid eras, the former leading to the creation of the Great Sahara in North Africa and the Empty Quarter in the Arabian Peninsula. The humid periods having ended some millennia ago, the region has long been prey to a dry climate conducive to desertification. This climate is characterised by repeated protracted or short periods of drought, declining precipitation rates, irregular rainfall and torrential rains, high temperatures, frequent heat waves and protracted daily and annual highs; and harsh winds consisting mainly of continental over maritime prevailing winds. Such variations, both ancient and modern, contributed to fragile ecosystems in arid and semi-arid areas which are characterised by sparse

vegetation and a prevalence of shallow, undeveloped topsoil structurally vulnerable to wind and water erosion.¹⁹ Table 2.2 shows the annual precipitation per capita across the region.

Desertification is a peril in the region. It is formally defined as “land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities.”²¹ This definition is the basis of the United Nations Convention to Combat Desertification (UNCCD). Environmentalists distinguish between two degrees of desertification: land that had once been under cultivation or vegetation but is now completely desertified; and land under cultivation or vegetation on which soil degradation will result in desertification unless preventive action is taken.

A joint LAS-UNEP study²² estimates that the highest ratio of desert to total land area is in the Arabian Peninsula (nine-tenths or 89.6 per cent). This is followed by North Africa (over three-fourths of the land or 77.7 per cent), the Nile Valley and the Horn of Africa (less than a half or 44.5 per cent) and the Mashreq (35.6 per cent).

Ongoing desertification threatens about 2.87 million square kilometres or a fifth of the total area of the Arab countries. Here the ratios proceed in the opposite direction to the preceding figures, with 48.6 per cent of the land area in the Mashreq facing the peril, 28.6 per cent in the Nile Valley and the Horn of Africa, 16.5 per cent in North Africa, and 9 per cent in the Arabian Peninsula.²³ The amounts of desertified land or land threatened by desertification vary greatly from one country to another within these regions. In North Africa, for example, they are the greatest in Libya and the least in Tunisia; in the Nile Valley-Horn of Africa region, they are the greatest in Egypt and Djibouti and the least in Somalia; and in the Mashreq they are the greatest in Jordan and the least in Syria. In the Arabian Peninsula, Bahrain, Kuwait, Qatar, and the U.A.E. are the most affected countries and together form the most desertified area in the Arab region, in contrast with Syria, which is the least desertified.

The most apparent impacts of desertification are aridity due to the depletion of groundwater or subterranean water

Table 2-2

Precipitation in the Arab countries, long term annual average²⁰

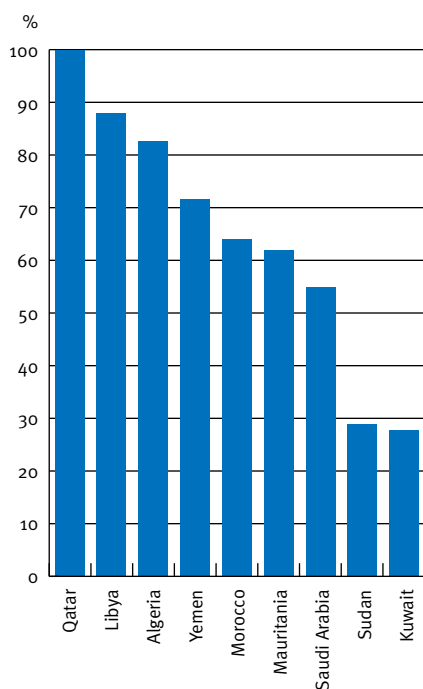
Country	Precipitation in cubic meters per capita
Mauritania	31,099.60
Sudan	27,678.10
Somalia	21,322.30
Libya	16,311.60
Oman	10,446.40
Algeria	6,341.60
Djibouti	6,230.80
Saudi Arabia	5,355.00
Morocco	4,918.60
Yemen	4,064.40
Tunisia	3,554.50
Comoros	3,259.40
Syria	2,406.30
Jordan	1,793.00
Lebanon	1,701.50
United Arab Emirates	1,536.80
Qatar	987.4
Kuwait	830.9
Egypt	693
Bahrain	79.8

Source: UNDP/AHDR calculations based on UNSD 2007.

Note: Precipitation refers to the total volume of atmospheric wet deposition (rain, snow, hail, dew, etc.) falling on the territory of the country over one year, in millions of cubic metres.

Figure 2-6

Extent of desertification in 9 affected Arab countries (%), 1996



Source: LAS and UNEP 2004 (in Arabic).

Desertification results from harmful activities undertaken by humans

Changing social systems: Large portions of the population of the Arab countries, particularly in arid and semi-arid areas, once engaged in nomadic or semi-nomadic pastoral or crop-gathering lifestyles. However from the 19th century in some countries and the mid-20th century in others, these populations gradually became sedentary. The transition from one lifestyle to the other in many cases brought with it overgrazing, tree-felling, and unregulated use of the soil in both rain-fed and irrigated agriculture, together contributing to despoliation of vegetation and soil degradation and erosion.

Changes in the mode of agricultural production: As traditional modes of production failed to meet the needs of the growing population, modern agricultural tools and technologies were increasingly brought into play. Many of these technologies, particularly in ploughing, are inappropriate to arid and semi-arid lands as they cause soil to decompose and disintegrate, rendering it vulnerable to erosion.

Box 2.5 illustrates how some of these trends have contributed to desertification in Algeria, (Ali Ghazi, in French, background paper for the report). In addition, the UNEP study summarizes the impact of human activities on desertification in the region as follows:²⁵

resources, shrinking forest areas and their further degradation through felling, cattle-raising, burning, and the loss of soil fertility and composition in arid lands.

The Arab countries' large proportion of desert land is due in large part to the arid natural endowment of the region, but is not solely the product of natural causes. It can also result from harmful activities undertaken by humans who, for the most part, are unaware of the detrimental impact of their activities on the natural environment. A study by the Arab Organization for Agricultural Development has attributed the causes of desertification in the Arab countries to the following developments:²⁴

Demographic explosion: The enormous growth in population, its mounting needs, its increasing use of modern technologies and methods in cultivation, and the overexploitation of the earth's various resources have greatly weakened the rejuvenating capacities of the region's ecosystems, distorted the environmental equilibrium, and propelled it towards degradation.

Box 2-4

West of Sudan: economic and social costs of desertification

In the western provinces of Darfur and Kordofan, competition over pastureland erupted into tribal warfare on a scale that led to international intervention. Among the foremost factors aggravating the fighting in this region were scarcity of rainfall, the population explosion, and changes in the prevailing social system from nomadic shepherding or crop gathering to sedentary agriculture. These factors augmented rates of soil degradation and desertification. In addition, cropland was expanded at the expense of natural pasturage while modern tools and equipment were employed in ploughing, transportation, and other agricultural processes, resulting in the decomposition, disintegration and erosion of the soil structure. To this list should be added the destruction of the natural vegetation through the felling of trees and uprooting of shrubs for fuel and manufacturing, wasteful over-irrigation, and the unsustainable use of land in both rain-fed and irrigated agriculture. All these factors, individually or combined, are conducive to desertifying forces such as water or wind erosion, the exposure of the subsoil rock strata and the salinisation or over-saturation of the soil.

Source: Dia El-Din El-Quosy, in Arabic, background paper for the report.

About 44 per cent, or more than 9 million hectares, of cultivated land in Algeria is now at risk of primary or secondary degree desertification. This threat is primarily attributed to the transition from traditional modes of animal husbandry and agriculture to modern systems. For example, in the past, severe drought waves would kill off large numbers of livestock, thereby alleviating pressure on available pasturage. While it is true that land reclamation operations were introduced to offset the effects of the transition, these were restricted to the lower altitudes where the soil was deeper and more humid.

For centuries, land management had been subject to long established social regulations that enabled generation after generation of rural societies to know the entitlements bequeathed to them. However the inherited system of land management that had been in harmony with nature quickly fell under the pressures of social, political, and economic change in Algeria, the roots of which are to be found in:

- The rapid growth of the population from around 11 million in the 1960's (10,800,000 in year 1960) to around 33 million in the first years of the third millennium (32,854,000 in year 2005). This tripling of the population, despite the decline in annual growth rate from 3.2 per cent to 2.3 per cent, has generated enormous pressures on the environment. Simultaneously, increased rates of urbanisation have increased the demand for meat, which, in turn,

has driven an expansion in the area of land cultivated to meet this demand.

- The use of inappropriate agricultural methods and machinery. In particular, the disk ploughs used in land reclamation, while appearing efficient, render vast tracts of land easy prey to wind erosion because of the way they break up the top soil.
- The impossibility of alleviating the pressures on pastureland. While the increases in flocks owing to advances in veterinary medicine may have come to the temporary aid of herdsman, these increases have also come at the expense of the regeneration of the pasturage. This development also coincides with the emergence of a class of large, mainly urban-based livestock farmers whose wealth enables them to overcome water shortages, and deal with the need to move herds from one place to another. The large livestock farmers, who were drawn to this activity because it is lucrative, are displacing the poor shepherds and farmers who do not possess the wherewithal to care for their flocks or fields.

As a result of such conditions, Algeria is losing some 7,000 hectares a year to desertification. If urgent remedial action is not taken, the rate of loss could double or triple.

Source: Ali Ghazi, in French, background paper for the report.

*Continued
desertification is
not inevitable*

- Degradation and desertification of pastureland.
- Deterioration of forests.
- Degradation of the soil due to land mismanagement.
- Attrition of subterranean aquifers.
- Water shortages and waste of water.
- Incursion of saline water.
- Pollution of the soil.
- Inappropriate irrigation systems.

Confronting the deserts

In spite of the challenging natural endowment of the region and the complicating factors of human impact, continued desertification is not inevitable. Equipped with information on its specific causes in each Arab climatic ecological region, Arab governments and societies can adopt the appropriate policies to halt it. Based on background papers carried out for this Report, the following sets of policy objectives can provide orientation to combat

desertification in the three major zones of the region:

In countries that depend on *both irrigation and rainfall* for agriculture, policies should aim to:

- Strengthen infrastructure through the construction of dams, reservoirs, canals, drainage systems, and road and electricity networks.
- Halt overgrazing in pastoral areas and tree felling in forested areas.
- Reduce the use of non-biodegradable pesticides, such as DDT, to the lowest possible levels.
- Promote the use of conventional and non-conventional means to prevent sand dune encroachment.
- Install precipitation gauges throughout the country and abroad and import and set up early warning systems to enable people to prepare for and take the appropriate precautions against high floods.
- Designate permanent and inviolable boundaries for the waterbeds of the major river courses and prohibit the

use of the floodplains within these boundaries during all flooding seasons, low, medium, and high.

- Engage civil society organisations in the design and execution of anti-desertification projects and in the recruitment of volunteers to help government agencies in emergencies.
- Train and build the capacities of those involved in combating desertification and also raise the capacities of the general public in this domain, drawing and building on indigenous knowledge and expertise.

In countries dependent *solely on irrigation* for agriculture, policies should aim to:

- Curb the effects of sand-carrying winds through windbreaks made of trees or solid materials and stabilise sand dunes by means of sand fences using plant materials, petrochemical sprays, or rubber blocks.
- Halt urban encroachment onto agricultural land by allocating desert land for the construction of public and private edifices, especially in towns and cities that back onto the desert.
- Promote agricultural drainage projects. Attention should extend beyond the implementation of such projects to continual monitoring and maintenance.
- Develop new water resources in order to keep up with the exponential growth of the population and its demands on clean water for domestic and public purposes and to meet the needs of industry, domestic navigation, tourism, electricity generation, and environmental preservation. In particular, attention should be devoted to collective Nile Valley projects to minimize water losses in the Upper Nile and to develop subterranean water resources, rain harvesting technologies, and water desalination research and technology.
- Take precautions against the anticipated effects of the rising sea level on the land and subterranean water reservoirs in the Delta. Scenarios should be drawn up to anticipate all possibilities so that the country is not forced to contend with this phenomenon unprepared.

(Dia El-Din El-Quosy, in Arabic, background paper for the report.)

Countries dependent on *rain-fed agriculture* should endeavour to:

- Adopt a strict and sustained land management policy that comprises diverse plans for soil usage.
- Intensify efforts aimed at combating desertification, especially in the depressions behind dams and in the plains areas.
- Stimulate agricultural extension services addressing, specifically, such concerns as crop rotation and the use of appropriate farming technologies. Care should be taken to attune these services to the social and cultural conditions of the farmers.
- Draw up long-range plans well in advance of the construction of dams and reservoirs so as to enable the relevant agencies to take the appropriate measures to protect the steep basins behind these dams and reservoirs five to ten years before their construction.
- Record the types of existing plants with an eye to identifying and protecting them, and eventually to diversifying them or selecting strains with particular characteristics for reproduction.
- Identify the areas most vulnerable to desertification so that they can be prioritised in anti-desertification programmes.
- Promote continued forestry research aimed at sustaining existing forests and woodlands and using their products rationally.
- Intensify reforestation efforts, particularly those taking place within the framework of national reforestation plans.
- Promote all appropriate means to support and protect forests and woodlands. (Ali Ghazi, in French, background paper for the report.)

Pollution: no grounds for complacency

With the Arab region's quickly increasing population and pressured, fragile environment, pollution is increasingly becoming a concern of policy makers and civil society. Pollution is not only a nuisance, but is also a considerable threat to human security when it contributes to the deterioration of the air, water and soil upon which people depend. While pollution is recognized by all to be a threat in the region, to date

Pollution is increasingly becoming a concern of policy makers and civil society

Pollution is a considerable threat to human security

detailed data on its levels and trends are not yet available. The statistics that do exist are limited to conditions at the national level, in spite of the fact that levels of pollution vary greatly between urban and rural areas and from one city to the next.

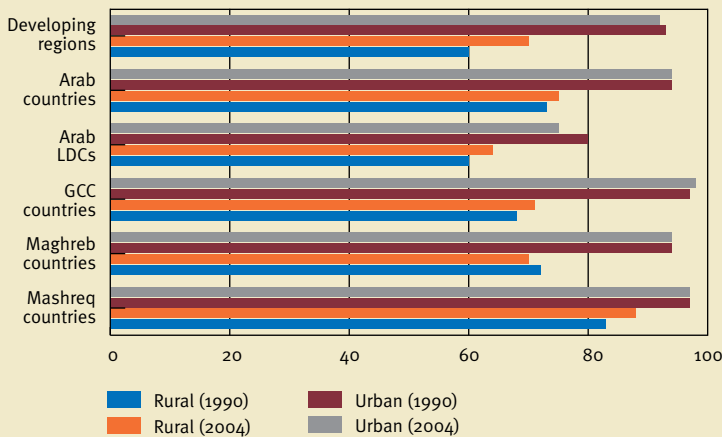
Pollution threatens the water, air, and soil of the Arab region. As the report team was unable to obtain data on the latter for this Report, this section focuses on pollution of the former two: water and air.

Box 2-6

MDG goal 7, target 10 - halve, by 2015, the proportion of people without sustainable access to safe drinking water

Distressingly, on Target 10, the Arab countries are off track. The proportion of the population in the region using improved drinking water sources rose slightly between 1990 and 2004 from 83 per cent to 85 per cent. It increased from 65 to 68 per cent in Arab LDCs. However, this sub-regional average does not include Somalia where only 29 per cent of the population had access to safe water in 2004. In the other three sub-regions, it reached 86 per cent in the Maghreb, 94 per cent in the GCC countries, and 86 per cent in the Mashreq.

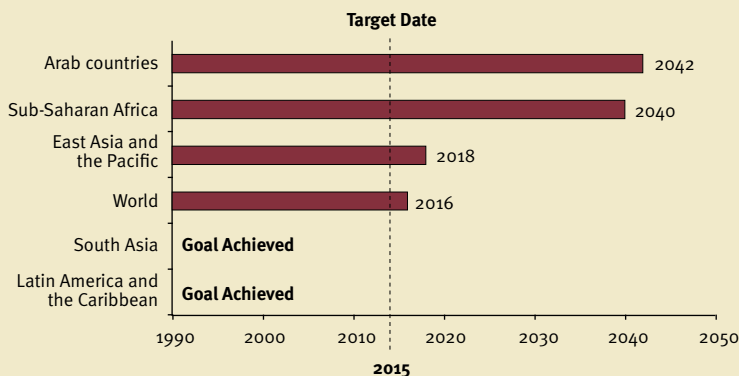
Proportion of population with access to improved drinking water sources in urban and rural areas, 1990 and 2004 (%)



Source: UN-ESCWA 2007.

This slight improvement indicates that significant efforts are still required to achieve the target, which continues to elude the Arab region as a whole.

Arab countries will miss the 2015 target for access to safe drinking water by 27 years



Source: UNDP 2006.

Source: UN-ESCWA 2007a.

Water pollution

Water pollution is now a serious challenge in the region. In the Arab countries, water pollution is primarily attributed to increased use of chemical fertilisers, pesticides, and horticultural and veterinary medical treatments that leave long-lasting traces that eventually find their way into the water. The influx of domestic and industrial wastewater has also considerably raised levels of water pollution.

In several parts of the Arab region, water pollution is manifested in low levels of access to clean water, a resource already constrained by general water scarcity, as analyzed above. The lack of access to sufficient clean water in particular threatens human security in many ways. It can lead to the spread of disease among children, such as dysentery, and affect their regular attendance at school and academic achievement. It deprives women, for example, of long hours of the day which they could devote to personal and income-generating activities rather than fetching water for their families. In addition, water scarcity and pollution threaten agricultural and food production and precipitate domestic rivalries over scarce water resources, as in the ancestral dispute between farmers and herders in Darfur. Water shortages can also cause tensions between neighbouring countries.

Access to clean water for domestic or economic purposes reflects power relationships. In general, the poor do not get clean water and the rich consume enormous amounts and have no problem obtaining the quantities they want. Unsurprisingly, the parts of a country that have the most difficult access to water are the rural areas and the poorer quarters of the city.²⁶

The World Bank's World Development Indicators provide water pollution data for 15 Arab Countries, showing, as in Table 2.3, that Egypt, Algeria, Tunisia, Morocco and Iraq are among the largest polluters in the Arab region, in terms of daily emissions of organic water pollutants. However the data also shows that these rates pale in

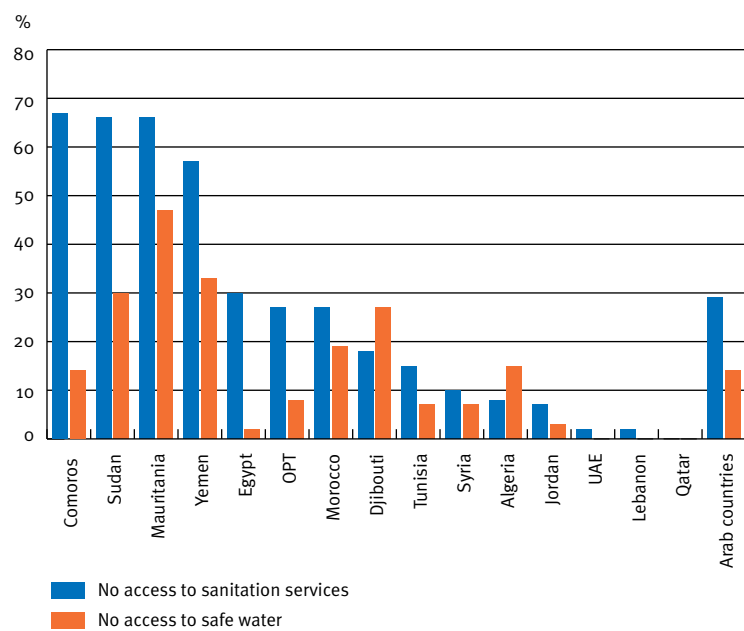
comparison to the daily rates of countries such as the United States, which showed in 2003 an absolute rate of pollution more than 10 times that of the highest Arab polluter, and the Russian Federation, which in that same year “out-polluted” the highest Arab polluter by a factor of nearly 7.5.

Nevertheless, these absolute comparisons offer no basis for complacency, as the per-worker ratio of pollution is relatively higher in Arab countries than in industrialised ones. Of the Arab countries, Tunisia succeeded in reducing this rate reaching levels comparable with the United States of America—from 0.18 kg per worker in 1990 to 0.14 kg per worker in 2003. Yemen and Syria also succeeded in reducing these rates respectively from 0.27 and 0.22 kg per worker daily in 1990 to 0.23 and 0.20 kg per worker in 2003.²⁷ Consequently, while the low rates of water pollution in some Arab countries indeed reflect efforts made by their governments, such countries must remain vigilant lest their plans for industrialisation eventually drive water pollution rates up to levels being experienced by developed countries and the newly industrialised countries of East and South Asia. In Egypt, for example, organic substances dumped in water fall into the following categories: food and drink (about 50 per cent), textiles (17.7 per cent), primary minerals (10.8 per cent), plus lower ratios of chemicals, paper, stones, glass and wood.²⁸

Also connected to water pollution is the region’s uneven and cumulatively lagging progress in providing its people with access to sanitation services. Based on the most recent data, Figure 2.7 shows that in some Arab LDCs (Comoros, Mauritania and Sudan), over 60 per cent of the population has no access to improved sanitation services. It also shows that, at the regional level, approximately 30 per cent of the population goes without such access. Not only does poor access to sanitation services infringe on the health and dignity of human beings, but it is also a factor contributing to water pollution, with widespread consequences for human security. According to the Human Development Report 2006, in Egypt, to name just one example, high levels of pollution from raw sewage in the Nile Delta region “undermines the potential health benefits of near universal access to water.”

Figure 2-7

Percentage of population without access to safe water and sanitation services, 15 Arab countries, 2007



Source: UNDP 2007.

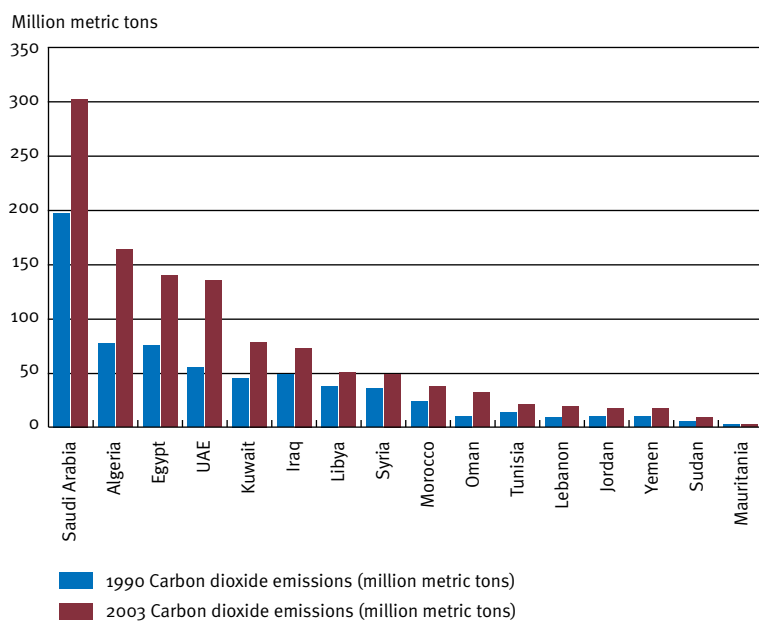
Table 2-3

Water pollution levels from organic pollutants in 15 Arab countries and 2 industrialised countries, 1990-2003 (in descending order based on 1990 pollution levels)

Country	Emissions of organic water pollutants (metric tons daily) in 1990	Emissions of organic water pollutants (metric tons daily) in 2003	Emissions of organic water pollutants (kilograms per worker daily) in 1990	Emissions of organic water pollutants (kilograms per worker daily) in 2003
Egypt	211.5	186.1	0.2	0.2
Algeria	107	...	0.25	..
Tunisia	44.6	55.8	0.18	0.14
Morocco	41.7	72.1	0.14	0.16
Iraq	26.7	...	0.19	..
Syria	21.7	15.1	0.22	0.2
Saudi Arabia	18.5	..	0.15	..
Kuwait	9.1	11.9	0.16	0.17
Jordan	8.3	23.5	0.19	0.18
Yemen	6.9	15.4	0.27	0.23
UAE	5.6	..	0.14	..
Oman	0.4	5.8	0.11	0.17
Sudan	..	38.6	..	0.29
Lebanon	..	14.9	..	0.19
Libya
United States	2565.2	1805.2	0.15	0.13
Russian Federation	1991.3	1388.1	0.13	0.18

Source: World Bank 2007.

Figure 2-8 Rising carbon dioxide emissions in Arab countries, 1990 and 2003



Source: World Bank 2008.

Air pollution

Although Arab countries are among the world's largest producers of petroleum-based energy sources, the levels of air pollution in Arab countries, in general, are among the lowest in the world. In 2003, carbon dioxide emissions did not exceed 1,012.5 metric tons in the Middle East and North Africa region, compared to 10,753.5 million metric tons in middle-income countries and 12,738.4 million metric tons in high-income nations. The only countries with lower carbon dioxide emission rates that year were sub-Saharan African countries, with an average of 531.9 million metric tons.²⁹

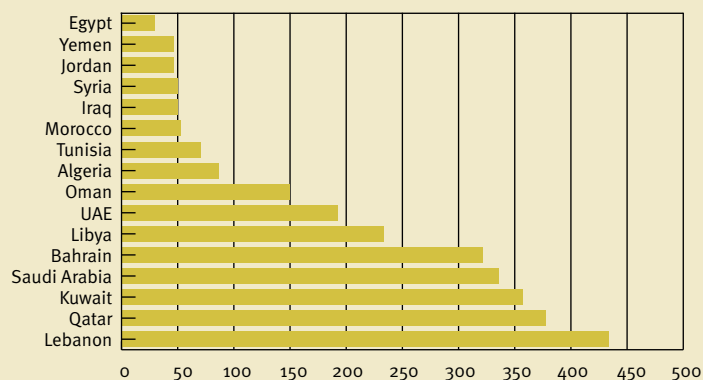
Nevertheless, what offsets this seemingly optimistic portrait is that Arab countries have such relatively low carbon dioxide emission rates mainly because most have not progressed very far in industrialisation. Even so, carbon dioxide emissions in North Africa and the Middle East are increasing at one of the fastest rates in the world. From 1990 to 2003 this rate was 4.5 per cent per year, which means that carbon dioxide emissions had nearly doubled by the end of that period. The only region in the world to surpass the Arab countries on that score was South Asia, at a rate of 4.9 per cent per year. It should also be borne in mind that carbon dioxide emissions vary between Arab countries, with the highest, in general, found in the oil producing and exporting countries, particularly those of the Gulf, as well as the countries with the largest economies. The top three are Saudi Arabia, Algeria and Egypt. Furthermore, carbon dioxide emissions rates vary considerably within Arab countries, the most marked contrast being between rural areas and major urban centres. The same observations apply to methane and nitrogen oxide emissions.³⁰

Efforts at the global level to decrease or at least stabilize air pollutant emissions have had some success since the introduction of stricter environmental regulations and enforcement policies, beginning in the 1970s. However, in the Arab region, socio-economic development, population growth, water scarcity and the growth of the oil industry have led to increased use of heavy fuels to meet development needs including power generation, cement production, oil refining and desalination of water.

Box 2-7 Road transport – emission of air pollutants

Air contamination in the Arab countries is attributed among others, to the transport sector, with its reliance on vehicles, especially in urban areas and during heavy traffic congestion. Road transport in the Arab countries, causes a variety of environmental and health impacts. Although the use of natural gas in the transport sector has increased, the pollution is aggravated by such regional trends as high rates of private vehicle ownership, as in Lebanon, Qatar and Kuwait and the ageing of vehicle fleets (in Egypt, for example, 65 per cent of cars are at least 10 years old and 25 per cent are more than 20 years old). However, a reduction in emitted pollutants is expected as a result of regional efforts to apply traffic strategies and fuel regulations in most Arab countries.

Number of vehicles per 1,000 inhabitants (2002-2004), 16 Arab countries



Source: AFED 2008.

Source: UN-ESCWA 2005c.

Apart from meeting development needs, transport is another major factor in air pollution in the region. Air traffic is increasing in the Arab countries, which is considered a major air transit route. The fleets that operate exclusively within it do not all meet mandatory aircraft engine certification standards, and therefore do not all abide by the international environmental protection standards governing aircraft emissions and the improvement of air traffic management systems.³¹ The growth of private vehicles has also made a significant impact, as illustrated in Box 2.7.

Climate change – the global threat

The climate system is an interactive, interwoven system composed of the atmosphere and the surface of the Earth, of ice and snow, of oceans and other water surfaces, and of living creatures. Climate change is the alteration in the overall climate of the Earth or specific regions over time. The term is applied to recent man-made climate changes. Industrial production, especially cement production, burning of fuels, air-borne particles, and human use of land and animals are the most significant man-made causes of climate change.

International concern with the problem of climate change became widespread when the “ozone hole” first attracted attention in 1974. The First World Climate Conference was held in 1979, with the World Meteorological Organization (WMO), the United Nations Environmental Programme, the World Health Organization (WHO), the Food and Agriculture Organization, and UNESCO participating. These international organizations reviewed research results that pointed to a clear increase in the amount of greenhouse gases.

Focusing on this subject, the WMO monitored gas emissions between 1974 and 1982 and measured their actual effects on the ozone layer. This layer, 15 or 20 km thick in the upper atmosphere, prevents ultraviolet light, considered harmful to humans, animals, and plants, from reaching the Earth.

The U.N. Intergovernmental Panel on Climate Change has said that the Earth’s

temperature has already risen by about 0.75 degrees Celsius since before the Industrial Revolution. It has estimated that by 2050, the Earth’s temperature will have increased by two degrees centigrade, compared with the beginning of the Industrial Revolution. As a result of the increased temperature, worldwide rainfall patterns will be altered causing a drop in global food production. From another angle, increased temperature will increase the rate of snow thaw, raising the sea level and submerging entire islands in the Pacific and Indian Oceans as well as all areas that lie below sea level.

These changes could affect human security in general as follows:

- Increasing numbers of heat waves and a gradual rise in the Earth’s temperature
- Extremes in rainfall trends, with rainy regions experiencing more rain and dry and arid areas becoming drier
- Increased tropical hurricane activity in the North Atlantic region and increased ocean temperature in tropical regions
- Higher sea level because of warmer water and thawing of ice and snow cover
- Higher sea water levels of carbonic acid, endangering many marine organisms because of the harmful effect on the calcification necessary for their protection
- Effects on food production. If the rise in temperature is moderate, there could be greater agricultural production in some areas; however, if the rise in temperature continues, production could be threatened in other regions, particularly Africa, which will see more occurrences of famine
- Decreased biodiversity and depletion of forested areas; 20 per cent could disappear according to some reports
- Significant health-related effects. The WHO has estimated that climate change caused 2.4 per cent of the world’s cases of diarrhoea and 6 per cent of malaria in certain middle-income countries in 2000. Even though the rise in temperature might have positive effects in cold regions by reducing cold-related deaths, the overall health-related effect would be negative because of food shortages, diarrhoea, malaria, and floods.

Industrial production and human use of land and animals are the most significant man-made causes of climate change

Climate change – the threats to the Arab countries

The region is one of those least responsible for the direct creation of the greenhouse effect

Along with other regions, the Arab countries will be greatly affected by climate change in the coming decades. Certain countries in the region share directly or indirectly in the activities that lead to climate change. The region is a major producer and source of oil, one of the types of fuel that raises the temperature of the atmosphere. In fact, it is more reliant on oil as a fuel source than any other region of the world, using oil for 54.2 per cent and natural gas for 40.2 per cent of its fuel needs. While it is true that reliance on oil dropped in most Arab countries in 2005 compared with 1990 (Kuwait, Libya, Qatar, and Sudan being exceptions), reliance on oil is still high in comparison with the rest of the world.

Nonetheless, the region is one of those least responsible for the direct creation of the greenhouse effect. According to the global Human Development Report (HDR) 2007/2008 and World Development Indicators for 2007, the region's share of

carbon dioxide emissions, which contribute to this phenomenon, was no more than 4.7 per cent, which is lower than any other region except Sub-Saharan Africa. Furthermore, its share of methane and nitrogen oxide emissions, which also contribute to heat retention, was the lowest of any region in the world because of its relatively low level of industrial development.

The region is also the nearest to becoming a direct victim of climate change, which affects it in the following ways:

- Water shortages
- Reduced agricultural production
- Large population transfers to foreign countries (environmental refugees)
- Lower levels of economic activities
- Threats to national security

The next section explains the dimensions of climate change in the Arab countries.

According to the Stern Report, temperature rises of between two and three degrees will have the following consequences affecting the region:

Spreading drought, reduced water levels in rivers, stunted agricultural production,

Table 2-4 Climate change future scenarios – water and agriculture

Scenario	Type of change	Effects on human security	Affected area
WATER	2 °C rise in Earth temperature	1 to 1.6 billion people affected by water shortages	Africa, the Middle East, Southern Europe, parts of South and Central America
	3 °C rise in Earth temperature	Increased water stress for additional 155 to 600 million people	North Africa
	Climate change	Repeated risk of drought known in recent years, with economic and political effects	Mauritania, Sudan and Somalia
	Climate change	Reduced average rainfall	Egypt, Jordan, Lebanon, and OPT
	Rising sea levels	Risk of flooding and threats to coastal cities	Gulf coast of Arabian peninsula
	Climate change	50% decline in renewable water availability	Syria
	1.2 °C rise in Earth temperature	Decreased water availability by 15%	Lebanon
	1 °C rise in Earth temperature	Reduced water runoff in Ouergha watershed by 10%	Morocco
	Climate change	Greater water shortages	Yemen
	Climate change	Reduced water flow by 40-60%	Nile river
AGRICULTURE	3 °C rise in Earth temperature	Increased risks of coastal surges and flooding	Cairo
	2-3 °C temperature rise in tropical regions	A drop by 25-35 % in crop production (with weak carbon enrichment) and by 20-15% (with strong carbon enrichment)	Africa and West Africa (Arab countries included)
	3 °C rise in Earth temperature	Reduced agricultural productivity and unsustainable crops	North Africa
	1.5 °C rise in Earth temperature	70% drop in yields of Sorghum	Sudan (Northern Kordofan)
	Climate change	Flooding of 4,500 km ² of farmland and displacement of 6 million people	Lower Egypt

Source: UNDP 2006; Stern 2006.

and incursion by sea water will force large numbers of people to emigrate, turning millions of people, particularly in the Nile River Delta and coastal areas in the Arab Gulf, into “environmental refugees.”

These developments could affect not only human security among communities, but national and regional security as well. Such severe changes may also affect political stability and increase domestic tension. Sudan has experienced internal conflicts in Darfur, for example, between pastoralists and farmers over access to water sources. Tension has also increased between Mauritania and Senegal with the disappearance of the river from flood plains, and Palestinian farmers suffer because Israeli settlers monopolize most ground water sources.

The 2007/2008 Human Development Report³² indicates that Egypt, Lebanon, Sudan, and the countries of North Africa could be the areas in the region most affected by climate change. Global warming caused by an increase in the Earth’s temperature by three or four degrees would raise sea level by approximately one metre, creating 6 million refugees in Egypt, with 4,500 square kilometres of agricultural land in the Delta flooded. Even if sea level rises by only one-half metre, it could create two million refugees and cause more than \$35 billion in economic losses. In addition, the ability to generate hydroelectric power would be affected, and flood precautions would leave millions of people unprotected. In the Kordofan region of Sudan, an increase in temperature of one and one-half degrees between 2030 and 2060 would reduce average rainfall by 5 per cent, leading to a general drop in agricultural production and a decrease in the production of maize by 70 per cent of current levels. An increase of 1.2 degrees centigrade would reduce available water in Lebanon by 15 per cent as a result of the change in rainfall patterns and evaporation. If the Earth’s temperature rises by one degree centigrade, it would reduce available water by 10 per cent in some areas of Morocco by 2020.

The international community has become more aware of the effects of these changes, formed committees, and ratified many agreements, like the Kyoto Protocol and the Climate Change Agreement, to which the Arab countries are bound.

Yet efforts in the Arab countries to confront the effects of these changes do not match the gravity of the threat. There is no single Arab institution concerned with the effect of climate change on the region. The only example of a collective effort is the earmarking by Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates of \$750 million for a new fund, established at the conclusion of the 18 November 2007 OPEC meeting, to counter the effects of climate change on these countries. Saudi Arabia contributed \$300 million, with the other three countries giving \$150 million each. The fund is intended to increase the use of environmentally friendly, more efficient technology to protect the local, regional, and global environment. It supports the development of technologies to remove and sequester carbon, as well as to facilitate the transfer of environmental technologies from advanced countries to all OPEC and other developing countries.

Such efforts would be a welcome change, and would hopefully break new paths in this region that has not yet accorded sufficient attention to environmental concerns. Protection of the environment ranks low on the agendas of Arab governments. The Environmental Sustainability Index, which covers 146 countries (16 Arab countries), and classifies countries according to their plans for natural resources, low population density, and successful management of the environment and development ranks several Arab countries at the bottom. For 2005 Iraq ranked near the bottom at 143, Sudan 140, Kuwait 138, Yemen 137, Saudi Arabia 136, Lebanon 129, Libya 125, Mauritania 124, Syria 118, Egypt 115 and the U.A.E. at 110. The highest-ranking Arab countries were Tunisia at 55, Oman at 83 and Jordan at 84. Finland, Norway, Uruguay, Sweden, and Iceland are at the top of the Index.³³

Conclusion

This chapter has attempted to clarify the implications for human security of the region’s particular resource endowments and the threats posed by their mismanagement, over-exploitation, neglect or degradation. It has also touched on the risks and opportunities associated with

Protection of the environment ranks low on the agendas of Arab governments

Environmental shocks in the near future will be far graver in their consequences than the toll of armed violence in Arab countries

Arab countries should move quickly to establish an Arab agency to coordinate specialised networks for environmental issues

its population growth patterns and youthful demographic profile. The potential dangers of environmental shocks in the near future will be far graver in their consequences than the toll of armed violence in Arab countries, whether the source of conflict is foreign occupation or internal strife. Victims of the drought that struck East Africa several years ago were estimated in the hundreds of thousands. Similarly, the conflict in Darfur, which is connected, in part, to drought and the fight over scarce sources of water and pastureland, has affected 4.27 million people in need of assistance of which, 2.5 million are internally displaced.³⁴

The very controversy over the number of victims of disputes whose roots can be traced to local environmental properties raises a deeper issue, namely the difficulty of determining accurately the effects of environmental degradation on human security conditions. The effect of the environment on human security is not in most cases direct, but mediated by such variables as the degree of wisdom brought to bear on interactions with the environment or the extent to which disputes that have their origin in environmental conditions are politically exploited. In addition, environmental degradation is a cumulative process in that a certain effect triggers others. Consequently, the impact of environmental change on human security varies from one country to another in accordance with these intermediate variables and the nature and extent of the cumulative chain reaction.

Nevertheless, environmental deterioration resulting from climate change, water scarcity, desertification, losses in biodiversity and deforestation is certain to produce a range of effects. These include:

1. Shrinkage in arable land area and, hence, a declining ability to produce food and agricultural raw materials.
2. The spread of unemployment and poverty in the countryside as a consequence, in particular, of the shrinkage in arable land and the decline in the quality of soil caused by drought and desertification.
3. Decline in the levels of public health as a result of the predicted rise in temperatures and failure to curb water, air, and soil pollution.
4. Rising tensions within agrarian societies and between farmers and shepherds

owing to rivalries over the control of water resources.

5. Rising conflicts between countries within a single river basin.

Naturally, it is impossible to confront all these challenges at the national and regional levels alone. Environmental issues are inherently global in nature and attempts to address them should thus be global as well. The Arab countries have kept pace with the global concern for environmental affairs and have ratified most environment-related conventions. Moreover, the brunt of the responsibility for some of these issues, particularly climate change, should be borne by the industrialized powers that contribute most to them.

At the regional level, it is essential for Arab countries to work together to confront the challenges posed by environmental degradation, especially the threats of water shortage, desertification, and pollution. Arab countries should move quickly to establish an Arab agency to coordinate specialised networks for environmental issues, collecting available information from Arab regional organisations, harnessing expertise and formulating the alternatives needed to tackle these issues.

At the country level, Arab governments have many means available to them to ensure the participation of influential social forces and the business community above all, in environmental protection efforts. Such means include the taxation system, incentives to use environmentally friendly technology, drives to use non-polluting renewable energy sources (solar power), policies that encourage economic uses of energy sources, campaigns for the use of mass transport over private automobiles, and the implementation of tough measures to combat desertification and deforestation.

Of course, no measure can successfully combat environmental degradation if it is not founded upon a thorough and accurate base of information and a precise understanding of changing environmental conditions. Therefore, the existing agencies in charge of protecting the environment must be fully supported, equipped and empowered to enable them to undertake the necessary studies and data collection. In countries where such agencies do not exist, they should be created.

Endnotes

- ¹ UN-ESCWA 2008.
- ² UN-Department of Economic and Social Affairs (DESA) 2007a.
- ³ UN-Department of Economic and Social Affairs (DESA) 2007a.
- ⁴ UN-Department of Economic and Social Affairs (DESA) 2007b.
- ⁵ UNFPA 2009.
- ⁶ UNDP/AHDR calculations based on FAO AQUASTAT database 2008.
- ⁷ UNDP/AHDR calculations based on FAO AQUASTAT database 2008.
- ⁸ AOAD 2003 (in Arabic).
- ⁹ AOAD 2003 (in Arabic).
- ¹⁰ AOAD 2003 (in Arabic).
- ¹¹ AMF, AFESD, LAS and OAPEC 2001 (in Arabic).
- ¹² UNDP 2006a.
- ¹³ UNDP 2006b.
- ¹⁴ UN-ESCWA 2007b.
- ¹⁵ UN-ESCWA member countries are Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, OPT, Qatar, Saudi Arabia, Syria, UAE and Yemen.
- ¹⁶ UNDP 2006b.
- ¹⁷ AFED 2008b.
- ¹⁸ The water used in the production process of an agricultural or industrial product is called the virtual water contained in the product. For additional information on virtual water see box 6-5 in Chapter 6 of the Report.
- ¹⁹ AFED 2008b.
- ²⁰ Long term annual average is the arithmetic average over at least 20 years
- ²¹ United Nations, Convention to Combat Desertification 1994a.
- ²² LAS and UNEP 2004 (in Arabic).
- ²³ LAS and UNEP 2004 (in Arabic).
- ²⁴ AOAD 2003 (in Arabic).
- ²⁵ LAS and UNEP 2004 (in Arabic).
- ²⁶ UNDP 2006b.
- ²⁷ World Bank 2007b.
- ²⁸ World Bank 2007b.
- ²⁹ World Bank 2007b.
- ³⁰ World Bank 2007b.
- ³¹ AFED 2008b.
- ³² UNDP 2007.
- ³³ SEDAC 2005.
- ³⁴ UN Special Rapporteur on the situation of human rights in the Sudan, 2008k.

