ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA (ESCWA)

ESCWA WATER DEVELOPMENT REPORT 2

STATE OF WATER RESOURCES IN THE ESCWA REGION

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Preface

There is a growing concern among the international community that a pending water crisis is threatening the entire global population, not only those living in arid to semi-arid areas. There is also a consensus on the need to periodically update the information on water resources across the world because of the rapidly changing situation. Hence, the United Nations established the World Water Assessment Programme (WWAP), with the primary objective of producing a comprehensive analysis on the global water situation in the form of a report published every three years. The first World Water Development Report (WWDR)[1] was published in 2003, the second in 2006[2] and the third is scheduled for 2009.

In that context, the Economic and Social Commission for Western Asia (ESCWA) has initiated a series of periodic publications on water development in the ESCWA member countries, the aim being to enhance the application of integrated water resources management (IWRM) concepts in the region, with the explicit objectives to: (a) provide regional water practitioners and decision makers with concise, but comprehensive reports on specific topics related to the sustainable management of available water resources; (b) establish an authoritative basis for managing the available resources; and (c) secure potential input of updated information and data on the ESCWA region to the United Nations WWDR series.

The first report in the ESCWA series on water development, published in 2003, addressed the vulnerability of the region to socio-economic drought.[3] This *Report*, the second in the series, focuses on the state of water resources.

[1] United Nations Educational, Scientific and Cultural Organization (UNESCO), *The First United Nations World Water Development Report: Water for People, Water for Life* (22 March 2003), available at: http://www.unesco.org/water/wwap/wwdr1/table_contents/index.shtml.

[2] UNESCO, *The Second United Nations World Water Development Report: Water, a Shared Responsibility* (22 March 2006), available at: http://www.unesco.org/water/wwap/wwdr2/table_contents.shtml.

[3] United Nations, *ESCWA Water Development Report 1: Vulnerability of the Region to Socio-economic Drought* (United Nations, New York, 2005), Sales No. E.05.II.L.17.

CONTENTS

LIST OF TABLES

CONTENTS (*continued*)

LIST OF FIGURES

ANNEXES

ABBREVIATIONS

CWR	Committee on Water Resources
DPSIR	driving force-pressure-state-impact-response
EC	electrical conductivity
FAO	Food and Agriculture Organization of the United Nations
GCC	Gulf Cooperation Council
GDP	gross domestic product
GWP	Global Water Partnership
IWRM	integrated water resources management
OECD	Organisation for Economic Co-operation and Development
PSR	pressure-state-response
SIWI	Stockholm International Water Institute
TDS	total dissolved solids
ESCWA	Economic and Social Commission for Western Asia
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WWAP	World Water Assessment Programme
WWDR	World Water Development Report
UNESCO	United Nations Educational, Scientific and Cultural Organization
AMF	Arab Monetary Fund
AFESD	Arab Fund for Economic and Social Development
OAPEC	Organization of Arab Petroleum Exporting Countries
NWRA	National Water Resources Authority (Yemen)
SDPD	Sustainable Development and Productivity Division (ESCWA)

Introduction

The ESCWA region is to a large extent an arid to semi-arid area where the livelihood of the large population is to a significant degree controlled by the scarcity of water, in addition to being affected by escalating political tensions and subsequent lack of security. It is also a region characterized by a relatively high population growth and, thus, a continuous increase in water demand. That has resulted in a gap between demand and supply which has widened over the years, particularly during the 1990s. In order to reduce that gap and augment the supply, the ESCWA member countries have been seeking additional water sources. The oil-rich Gulf Cooperation Council (GCC) countries have invested heavily in desalination for drinking and domestic use and modern treatment plants for tertiary treated water for irrigation. However, such non-conventional sources are having an adverse effect on the environment and the quality of water in the aquifer systems. The less rich countries, particularly those with agriculture-based economies, have opted for other solutions, namely, the construction of recharge dams and diversion structures and the reuse of agricultural return flow and industrial and domestic wastewater, often treated to the primary or secondary levels only.

From 1975 to 2000, the implications of increased water demand in the ESCWA region was overshadowed by a preoccupation with industrial and socio-economic development issues, resulting mostly from the economic boom experienced in the Gulf area which, though slowly but undoubtedly, have affected neighbouring countries. In the absence of effective control measures and/or regulating mechanisms, overexploitation of the limited water resources available in the region has continued in a rapid and irrational manner. With vast areas of uncultivated arable land in the region, especially in non-GCC countries, it is understandable that irrigation takes the largest share of water and becomes the prime driving force for the increasing demand and, hence, un-sustainability of the resources. Like many other parts of the world, however, the ESCWA region is witnessing a dramatic shift in priorities towards a more sustainable use of available resources. Irrigation, which was seen as an essential step towards the achievement of self-sufficiency in food production throughout the 1970s and 1980s, became regarded as a low-value use for water in comparison with municipal and industrial uses in the late 1990s. Many countries in the region are also beginning to include environmental protection in their national plans in order to give the ecosystem a fair share of the available water for sustaining fauna and flora and allowing effective recharge of the aquifer systems.

The triggering effect of the water problem in the ESCWA region is the “socio-economic dilemma” of developing countries situated in a typical arid and semi-arid environment where water and/or financial resources are limited. On the one hand, such countries try to provide the necessary water and food required for the well-being and decent life of their population and the self-autonomy of their State. On the other hand, they strive to attain the industrial and economic development levels necessary for maintaining a modern-day affluent way of living for the largest portion of the population.

Hence, the strong pressure exerted on freshwater sources, namely, surface water and groundwater, is not only due to excessive use and overdraft, but also to the remedial measures taken to handle the overexploitation which, in itself, has created new pressures. The situation becomes more serious when such impacts are superimposed on the harsh climatic condition prevailing in the region. The diversity in water use in the 13 ESCWA member countries, as a result of the great differences among them in terms of both economic affluence and per capita share of freshwater, is an additional challenge that should not be underestimated.

The gap between the three main water use sectors, namely, domestic, industrial and agricultural, becomes wider over the years. It was estimated[4] that the water requirements of those sectors, in terms of

[4] ESCWA, *Sectoral Water Allocation Policies in Selected ESCWA Member Counties: An Evaluation of the Economic, Social and Drought-related Impact* (United Nations, New York, 2003), E/ESCWA/SDPD/2003/13.

millions of cubic metres (m^3), will increase dramatically in the ESCWA region over the next 20 years, as is illustrated in table 1.

TABLE 1. WATER USE PER SECTOR IN ESCWA MEMBER COUNTRIES
(*Million m^3*)

Sector	2000	2025
Domestic	13 866	30 244
Agricultural	150 697	192 266
Industrial	16 498	25 243
Total	181 061	247 753

Source: ESCWA, *Sectoral Water Allocation Policies in Selected ESCWA Member Countries: An Evaluation of the Economic, Social and Drought-related Impact* (United Nations, New York, 2003).

Based on the projected figures shown in table 1, the total demand for water in the ESCWA region is expected to increase by about 50 per cent by the year 2025 to 247,753 million m^3, compared with 181,061 million m^3 in 2000. The total volume of freshwater available in 2000 was estimated at about 179,494 million m^3, of which 169,247 million m^3 was from conventional sources, and 10,247 million m^3 from non-conventional sources. With the total demand in 2000 nearly equalling the total volume available, it can be envisaged how aggravated the water problems may be in the year 2025. With that realization, the ESCWA member countries are beginning to take measures for the application of IWRM concepts towards a more sustainable use of the limited water resources in the region. In order to monitor the implementation of such concepts, a set of indicators are needed to address the three principal targets for IWRM, namely, social welfare and equity, economic efficiency and environmental sustainability. Such indicators should represent the three subsystems of an integrated water resources system, namely, the natural subsystem that supplies the water, the socio-economic subsystem or boundary conditions for any sustainable development and the institutional-legal subsystem that provides the framework for enhancing IWRM application.

Assessing the state of water resources in the region has therefore to proceed against that background. The assessment has also to be based on the most updated information and data available, a challenging task since data acquisition is limited by the inadequacy of monitoring networks. Similarly, the reliability and accuracy of data are often seriously affected by a lack of appropriate methodology, suitably equipped laboratories and facilities, or technically trained staff to analyse and interpret the data in a scientific and comprehensive manner.

Within the 1998-1999 programme, and in collaboration with member countries, ESCWA, through the Committee on Water Resources (CWR), is updating the assessment of water resources in the region. Following visits to a number of member countries to collect data and first-hand information, ESCWA produced the report *Updating the Assessment of Water Resources in ESCWA Member Countries*,[5] and the ESCWA Team on Water and Environmental Issues has been analysing, updating and assessing the available information.

This *Report* gives an overview of the water resources in the ESCWA region based on the most recent data and information obtained from member countries. The state of water resources in the region is analysed and assessed on the basis of data and indicators selected from available information and within the context of IWRM. The *Report* gives a comprehensive summary of the current situation of water resources in each member country in terms of availability, accessibility and sustainability.

[5] ESCWA, *Updating the Assessment of Water Resources in ESCWA Member Countries* (United Nations, New York, 2003), E/ESCWA/ENR/1999/13.

Methodology

1. *General approach*

In ESCWA member countries, water-related data are often fragmented in several governmental organizations, and only recently have some countries established designated ministries or centralized agencies responsible for the management of water resources. Examples include the Ministry of Water and Environment of Yemen and the General Organization for Water Resources of the Ministry of Irrigation of the Syrian Arab Republic, which both aim to monitor the status of available water resources and establish a comprehensive database for their respective country. Notwithstanding that the prime responsibility of those authorities is to monitor the status of the available water resources, and considering the paucity and extreme difficulty in obtaining water-related socio-economic, institutional and legal information at that stage, the prime objective of this *Report* is to provide a comprehensive understanding of the state of water resources in the ESCWA region.

One of the mandates of CWR is the "monitoring of developments in the field of water resources" in ESCWA member countries. Primary data for this *Report* were gathered through surveys on water resources completed by CWR members in 2005. Committee members were also contacted in 2006 for the updating of the data. For secondary data, ESCWA used other national sources and also publications prepared by member countries, the United Nations, ESCWA and recognized regional organizations. If data were unobtainable from any of those sources, other relevant research material and related studies were used.

Analysis of all available data and information was undertaken to determine freshwater availability, including current sectoral use, especially in the agricultural sector which consumes a significant portion of the water; dependency and accessibility levels to available resources; and sustainability for each of the 13 ESCWA member countries. The *Report* was prepared with the understanding that it would assist member countries in analysing their national data and improving their data collection in order to obtain necessary information required for sustainable development of their water resources, in addition to providing them with information and data from other countries, especially those with which they may be sharing a common water resource. It is hoped that the comprehensive information provided on each country, attached in annex I, will be the basis for country-level water profiles that can be expanded and updated by ESCWA through regular contacts and discussions, and used as a standard reference on the status of water resources in member countries so as to avoid discrepancies prevalent in many publications.

The state of water resources is determined not only by the availability of water, but also by the demand and institutional set-up for the management of those resources. Assessing and analysing the state of water in the ESCWA region were therefore undertaken within the scope of IWRM, and the developing of indicators for that purpose was directed towards the identification and selection of parameters with clearly-defined criteria covering aspects and issues related to IWRM. Annex III contains basic definitions and criteria adopted in this *Report*. A brief description of the framework adopted for analysing the available data and information is shown as follows.

2. *Indicator development*

The choice of framework and set of indicators must meet the needs and priorities of the users, in this case national experts, civil society groups and decision makers responsible for the development and use of such indicators, to monitor progress towards sustainable management of water resources.

In the literature, different approaches exist on how an indicator, or a set of indicators, can be built.[6] The major indicator development models have been shaped by four approaches, namely, bottom-up

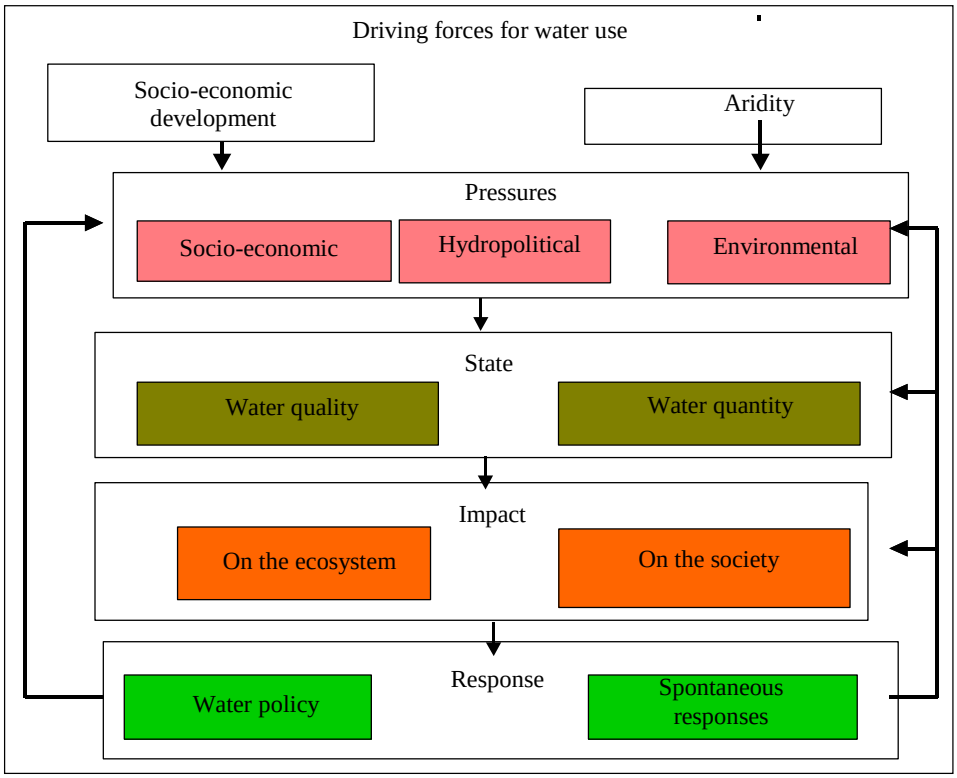
[6] UNESCO, *The First United Nations World Water Development Report: Water for People, Water for Life* (22 March 2003), available at: http://www.unesco.org/water/wwap/wwdr1/table_contents/index.shtml.

approach, top-down approach, systems approach and cause-effect approach, commonly known as pressure-state-response (PSR). The advantage of the PSR approach, introduced by the Organisation for Economic Co-operation and Development (OECD) in 1994, is that it enables trade-offs and the linking of environmental, economic and social indicators.

Following the PSR approach, and with the need to expand the framework to deal more specifically with human activities that positively or negatively impact on sustainable development, the driving force-pressure-state-impact-response (DPSIR) has evolved as the most widely used indicator framework for the analysis of water resources issues by the United Nations and other international organizations. The DPSIR framework was selected the appropriate approach for WWDR1 and WWDR2. For the purpose of this *Report*, and in consistency with the United Nations approach, DPSIR was adopted as the general framework. The specific framework proposed by ESCWA, however, also takes into consideration the specificities of the region, most notably the aridity and the geopolitical conditions, as shown in figure 1.

Figure 1 suggests that social and economic changes related to development, including population growth, agricultural policies, food demand and new technology innovations, coupled with the aridity prevailing in most of the ESCWA region, constitute driving forces that cause different kinds of pressures, namely, socio-economic, hydropolitical and environmental. As a consequence, the state of water resources, in terms of both quantity and quality, may deteriorate, leading to impacts on the society, as well as on the ecosystem. Those impacts would elicit responses in the form of societal measures to relieve some of the pressures from the system in terms of effective water policies, or by spontaneous responses from the natural system to adjust itself to the increasing pressures.

Figure 1. DPSIR framework proposed by ESCWA for Western Asia



Water data and other related information on the state of water resources in ESCWA member countries come from various government organizations dealing with water issues, but which may or may not have been mandated to manage those resources. Hence, the information available may be diversified, fragmented, incompatible, of limited scope and often not updated or closely analysed to allow for effective management planning. For the purpose of this *Report*, all available information has been compiled and analysed. The steps and procedures taken to put that information in a DPSIR framework are set forth as follows:

(a) Itemizing the information into two main groups, namely: (i) data; and (ii) indicators; as the nature of information presently available in ESCWA member countries does not allow aggregation to the level of indices at that stage;

(b) Preparing a complete list of the most up-to-date water-related information, compiled on a country-by-country basis;

(c) Breaking down the main list into five categories, namely, (i) general socio-economic data; (ii) water resources availability; (iii) land and water resources use; (iv) sustainability of use; and (v) accessibility and basic indicators;

(d) Categorizing each indicator in accordance with the DPSIR framework.

A total of 57 data points were identified for each country, 28 basic data and 29 basic indicators, as listed in annex I. A listing of the indicators which are used as the basis for analysing the state of water resources in the region, are shown in table 2. The indicators are grouped as follows:

(a) Seven indicators for water resources availability, four indicating state and three indicating response;

(b) Eleven indicators for water and land resources use, five indicating driving forces and six indicating pressure;

(c) Eight indicators for dependency and accessibility, two indicating state and six indicating response;

(d) Three indicators for sustainability, one indicating pressure and two indicating state.

In summary, the indicators developed for assessing the state of water resources in the ESCWA region are as set forth as follows:

(a) Five indicators for driving forces (D) to use the resources;
(b) Seven indicators for pressure (P) exerted on the resources;
(c) Eight indicators for state (S) of the resources;
(d) Nine indicators for response (R) of the resources.

It is evident that there is a need to develop indicators on the impact on both the society and the ecosystem of the present use of resources. It is also clear that additional indicators on the state of the water resources would be useful, especially with respect to quality.

TABLE 2. LISTING OF BASIC INDICATORS ON THE STATUS OF WATER RESOURCES IN THE ESCWA REGION

Serial number		Indicator	Unit	Type
1	Indicators for water resources availability	Available surface water as a percentage of total renewable water resources	%	S
2		Groundwater as a percentage of total renewable water resources	%	S
3		Per capita share from renewable water resources	m^3/p/y	S
4		Per capita share from non-renewable water resources	m^3/p/y	S
5		Desalinated water produced as a percentage of total renewable water resources	%	R
6		Treated wastewater and agricultural drainage produced as a percentage of total renewable water resources	%	R
7		Non-conventional water resource produced as a percentage of renewable water resources	%	R
8	Indicators for water and land resources use	Domestic water use as a percentage of total water use	%	D
9		Per capita domestic water use	m^3/p/y	P
10		Agricultural water use as a percentage of total water use	%	D
11		Per capita agricultural water use	m^3/p/y	P
12		Industrial water use as a percentage of total water use	%	D
13		Per capita industrial water use	m^3/p/y	P
14		Agricultural land as a ratio of total land	%	P
15		Cultivated land as a ratio of total land	%	D
16		Irrigated land as a percentage of agricultural land	%	P
17		Agricultural GDP as a percentage of total GDP	%	D
18		Agricultural economic efficiency	%	P
19	Indicators for dependence and accessibility	Groundwater abstracted as a percentage of total water resources used	%	S
20		Per capita use of freshwater resources	m^3/p/y	S
21		Percentage of urban population with access to improved drinking water as a result of societal measures to relieve water pressure	%	R
22		Percentage of rural population with access to improved drinking water as a result of societal measures to relieve water pressure	%	R
23		Percentage of total population with access to improved drinking water as a result of societal measures to relieve water pressure	%	R
24		Percentage of urban population with access to improved sanitation as a result of societal measures to relieve water pressure	%	R
25		Percentage of rural population with access to improved sanitation as a result of societal measures to relieve water pressure	%	R
26		Percentage of total population with access to improved sanitation as a result of societal measures to relieve water pressure	%	R
27	Indicators for sustainability	Groundwater use intensity	%	P
28		Water deficit	m^3/p/y	S
29		Water stress	100p/unit	S

Abbreviations: m^3/p/y, cubic metres per person per year; GDP, gross domestic product; p/unit, persons per unit flow (one unit flow is one million m^3 of renewable water).

I. REGIONAL FEATURES INFLUENCING THE STATE OF WATER RESOURCES

The state of water resources and their availability for development depends not only on the supply of freshwater, but also on the rate of consumption. It is the balance between demand and supply that determines the state of water as a resource, and how much of it is available in terms of quantity and quality. Hence, the most important factors that influence the state and availability of renewable water resources in the ESCWA region are, for the demand side, population growth and urbanization,[7] and, for the supply side, climatic conditions, drainage systems and hydrogeological features. A brief description of those five main factors is given below.

A. POPULATION GROWTH

The ESCWA region used to be characterized with a high population growth rate throughout the 1980s and 1990s. As a result, the total population in the region increased by almost 30 per cent since 1995, from about 150 million in 1995 to almost 190 million in 2005, as shown in table 3. Since then, however, there has been a significant fluctuation in the population growth rate across the region. The fluctuation is observed mainly in the GCC countries, with a significant drop in the growth rates of Bahrain, Kuwait and Oman, while Qatar and the United Arab Emirates have experienced an increase in growth rates since 1995. The emerging trend, however, is a general decrease in the population growth rate in all ESCWA member countries, as shown in table 3. Notwithstanding that fact, the total population in the region is expected to reach about 278 million by the year 2025, as indicated in figure 2 and table 3, translating into an increase of 47 per cent since 2005 and 86 per cent since 1995. Such a sharp increase in population would entail a strong competition over the available water and land resources.

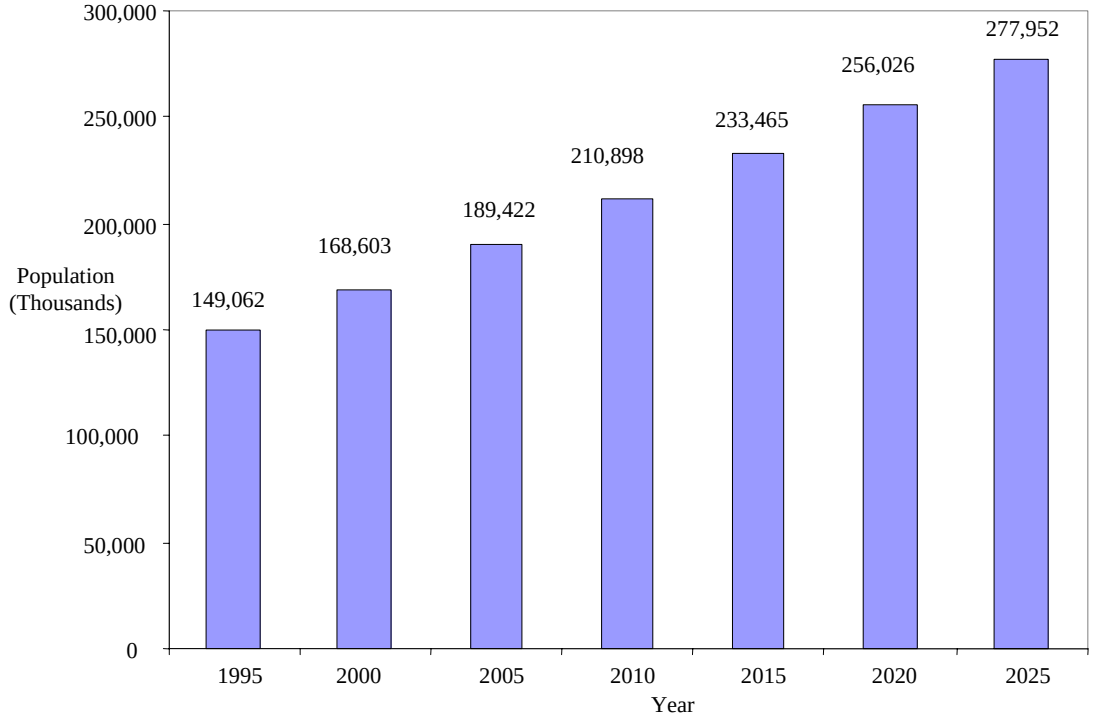
TABLE 3. TOTAL POPULATION FOR ESCWA MEMBER COUNTRIES DURING THE PERIOD 1995-2005, PROJECTED TO 2025

	Total population (*thousands*)						
	1995	2000	2005	2010	2015	2020	2025
Bahrain	579	652	728	797	862	923	980
Egypt	60 904	66 842	73 256	80 062	86 873	93 384	99 480
Iraq	21 703	25 134	28 084	30 788	35 059	39 304	43 484
Jordan	4 322	4 816	5 566	6 480	6 962	7 521	8 096
Kuwait	1 728	2 232	2 705	3 057	3 389	3 708	4 015
Lebanon	3 523	3 805	4 050	4 275	4 489	4 684	4 858
Oman	2 177	2 409	2 515	2 778	3 066	3 360	3 643
Palestine	2 636	3 166	3 781	4 431	5 115	5 833	6 586
Qatar	526	618	797	886	968	1 044	1 108
Saudi Arabia	18 301	20 871	23 700	26 528	29 401	32 254	35 007
Syrian Arab Republic	14 655	16 570	18 973	21 532	23 640	25 735	27 718
United Arab Emirates	2 435	3 252	4 112	4 741	5 275	5 791	6 290
Yemen	15 570	18 236	21 156	24 543	28 365	32 484	36 686
ESCWA	149 062	168 603	189 422	210 898	233 465	256 026	277 952

Source: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

[7] Urbanization is used here as a measure of affluence, which results in an increase in the per capita water use.

Figure 2. Population in the ESCWA region (1995-2025)



Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2004 Revision*, available at: http://www.un.org/esa/population/publications/WPP2004/wpp2004.htm; and *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

TABLE 4. TRENDS IN POPULATION GROWTH RATE IN ESCWA MEMBER COUNTRIES

	Growth rate (*percentage*)					
	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Bahrain	2.80	1.56	1.79	1.56	1.35	1.18
Egypt	1.89	1.91	1.76	1.61	1.42	1.24
Iraq	2.95	2.78	1.84	2.60	2.28	2.01
Jordan	2.96	2.74	3.04	1.41	1.52	1.45
Kuwait	5.48	3.73	2.44	2.04	1.77	1.55
Lebanon	1.35	1.03	1.05	0.94	0.82	0.71
Oman	2.30	1.00	1.97	1.95	1.81	1.58
Palestine	3.76	3.23	3.18	2.87	2.63	2.42
Qatar	2.85	5.86	2.11	1.76	1.49	1.16
Saudi Arabia	2.80	2.69	2.24	2.05	1.84	1.62
Syrian Arab Republic	2.61	2.49	2.52	1.85	1.68	1.47
United Arab Emirates	5.76	6.51	2.85	2.13	1.85	1.64
Yemen	3.29	3.13	2.97	2.90	2.71	2.43

Sources: For the years 1995 to 2005: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2004 Revision*, available at: http://www.un.org/esa/population/publications/WPP2004/wpp2004.htm. For the years 2005 to 2025: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

B. URBANIZATION

Domestic water consumption in urban areas is usually considerably higher than in rural areas because of the increased need of affluent populations living in cities. Urbanization is therefore a significant factor in increasing water demand and, hence, in exerting pressure on the available water supply sources. With increasing urbanization, that pressure eventually may extend to the peripheral zones of major towns and cities, and lead to potential conflict between urban-rural populations competing over the same water sources.

Table 5 shows that, between 1990 and 2005, urban population increased in all ESCWA member countries except Egypt, Iraq and the United Arab Emirates. The increase is expected to continue for the coming 15 to 20 years and will most likely affect all countries in the region. Egypt, the Syrian Arab Republic and Yemen are likely to experience the highest increases of between 8 and 11 per cent, as shown in table 5. Considering that their combined population constitute approximately 60 per cent of the present total population in the region, as is illustrated in table 3, it can be anticipated that the increase in urban population will have a significant effect on the state of water resources in those countries, particularly Egypt and the Syrian Arab Republic which depend primarily on water resources coming from outside their political boundaries.

TABLE 5. URBANIZATION IN ESCWA MEMBER COUNTRIES DURING THE PERIOD 1990-2005, PROJECTED TO 2025
(*Percentage*)

	1990	1995	2000	2005	2010	2015	2020	2025
Bahrain	88.1	91.6	94.6	96.5	97.6	98.2	98.5	98.6
Egypt	43.5	42.8	42.5	42.8	43.7	45.4	47.7	50.7
Iraq	69.7	68.8	67.8	66.9	66.6	66.9	67.8	69.4
Jordan	72.2	78.4	80.4	82.3	83.9	85.3	86.5	87.6
Kuwait	98.0	98.1	98.2	98.3	98.4	98.5	98.6	98.6
Lebanon	83.1	84.8	86.0	86.6	87.2	87.9	88.6	89.3
Oman	65.4	71.7	71.6	71.5	71.7	72.3	73.3	74.7
Palestine	67.9	70.4	71.5	71.6	72.1	72.9	74.1	75.6
Qatar	92.2	94.1	94.9	95.4	95.8	96.2	96.5	96.7
Saudi Arabia	76.6	78.7	79.8	81.0	82.1	83.2	84.2	85.2
Syrian Arab Republic	48.9	49.8	50.1	50.6	51.7	53.4	55.5	58.1
United Arab Emirates	79.1	78.4	77.4	76.7	76.9	77.4	78.2	79.3
Yemen	20.9	23.7	25.4	27.3	29.4	31.9	34.8	38.1

Source: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

C. CLIMATIC CONDITIONS

The ESCWA region covers an area of approximately five million square kilometres, of which 95 per cent is categorized as extremely arid, arid or semi-arid, extending across the Arabian Peninsula and encompassing the total territory of Egypt with the exception of the coastal strip along the Mediterranean Sea. Humid to sub-humid conditions prevail only in the mountainous areas along the northern and southern extremities of the region.

The northern mountainous areas include Lebanon, the West Bank in Palestine and the northern parts of Iraq, Jordan and the Syrian Arab Republic. During the months of November to February, those areas come under the effect of low atmospheric pressure zones, causing the cold fronts over Siberia and the Atlantic to pass over the Mediterranean Sea, where they get saturated with moisture. The result is precipitation that occurs between October and April or early May, with higher precipitation from December to February. High precipitation of 1,000 to 1,500 millimetres per annum (mm/a) occurs in Mount Lebanon and its northern

extension along western areas of the Syrian Arab Republic, as illustrated in figure 3, progressively diminishing as the fronts pass over the coastal mountain ranges and reaches Jordan, northern Saudi Arabia and western Iraq. In Egypt, there is almost no rainfall some tens of kilometres from the Mediterranean coast, as the country is outside the areas usually affected by cyclones.

The southern part of the Arabian Peninsula is usually affected by south-westerly monsoon winds, which bring moisture from the Indian Ocean to the coastal mountains of Yemen, the Hijaz region of Saudi Arabia and Oman. Most of the precipitation occurs in the upland areas during the summer months of May to August, but often arrives as early as March and continues until September. Normally, precipitation ranges from 500 to 1,000 mm/a in the highlands, usually in the form of heavy showers followed by flash floods; however, in the south-western escarpment of Yemen, rainfalls of up to 1,500 mm/a are common. With respect to the overall picture, it can be seen from figure 3 that the larger part of the ESCWA region receives precipitation far below 100 mm/a.

D. DRAINAGE SYSTEMS

The main physiographic feature that influences the development of drainage patterns and surface water generation in the ESCWA region is the Red Sea-Dead Sea-Gulf of Aden rift systems associated with the tectonic movement that split the Afro-Arabian plate. Water divides running across the mountain ranges that developed along those rifts have formed two types of surface water systems, namely, one that runs towards the coastal plains, and another flowing into the interior basins and depressions. In addition, there are two large drainage systems that originate outside the region. Hence, there are four types of surface water drainage systems, namely, interregional river system, intraregional river system, intraregional wadi system and local wadi system.

1. *Interregional river system*

The interregional river system comprises the large drainage basins of the Nile, the Euphrates and the Tigris that have their headwaters outside the ESCWA region. The Nile is nearly the sole source of water in Egypt and ranks among the largest rivers in the world. It has a total length of about 6,825 kilometres (km) and a drainage area of about 3.3 million square kilometres (km^2), with about 85 per cent of the total flow originating in the Ethiopian highlands through the Blue Nile, the Soba and Atbara rivers. The remainder of the flow originates in the equatorial lakes and discharges to the main river channel through the White Nile and Bahr el Ghazal.

The Euphrates and the Tigris are the major water sources for Iraq and the Syrian Arab Republic, originating in the Taurus mountains of Turkey, at an altitude of some 3,000 metres, and flowing south to converge and form the Shatt al Arab waterway in Iraq, before discharging into the Gulf. The Euphrates is 2,330 km long and covers an area of about 647,075 km^2, while the Tigris has a total length of 1,718 km, 1,418 km of which is in Iraq, and a drainage area of about 146,239 km^2.

2. *Intraregional river system*

The intraregional river system comprises those rivers that originate within the region and may or may not be shared by two or more ESCWA member countries before discharging to the sea or outside the region. The main rivers are in the Jordan-Lebanon-Palestine area, namely, the rivers of Kabir, Asi (Orontes), Litani, Hasbani and Jordan.

3. *Intraregional wadi system*

The intraregional wadis, or plains, stretch towards the desert areas, with intermittent or ephemeral flows originating in one ESCWA member country and discharging into inland depressions and interior plains outside the political boundary of that country. Such wadis are most prevalent along the inland boundaries of

countries situated in the southern fringes of the Arabian Peninsula, namely, Oman, the United Arab Emirates and Yemen.

4. *Local wadi system*

The local wadis originate and terminate within the political boundaries of a country, or directly into the sea. Many are along coastal plains, for example, Tiran, but a number are also found in the upland intermontane areas of Saudi Arabia, namely, the Hijaz region, and in Oman and Yemen.

E. HYDROGEOLOGICAL FEATURES

Broadly speaking, there are three groups of geologic units that constitute the framework for the development of groundwater systems across the ESCWA region, namely: (i) igneous and metamorphic rock of the Arabian Shield, and the sedimentary rocks covering the remaining part of the Arabian Peninsula and the Levant; (ii) volcanic rock adjacent to rift margins; and (iii) alluvial sediments along the wadi channels. Accordingly, six types of aquifer systems, or groundwater basins, have developed in the region, as illustrated in figure 4. They are set forth as follows:

1. Type 1: Extensive sedimentary basins with relatively high productivity of essentially fossil groundwater with acceptable quality; mainly sandstone of Cretaceous period or older.

2. Type 2: Extensive sedimentary basins with generally high, but variable productivity of essentially fossil groundwater with potential for significant salinization; mainly carbonates of Cretaceous period to Palaeogene epoch.

3. Type 3: Local or discontinuous sedimentary basins limited mostly to mountainous areas containing renewable, good-quality groundwater with variable productivity and commonly discharging as springs; mainly karstic carbonates of Cretaceous period to Miocene epoch.

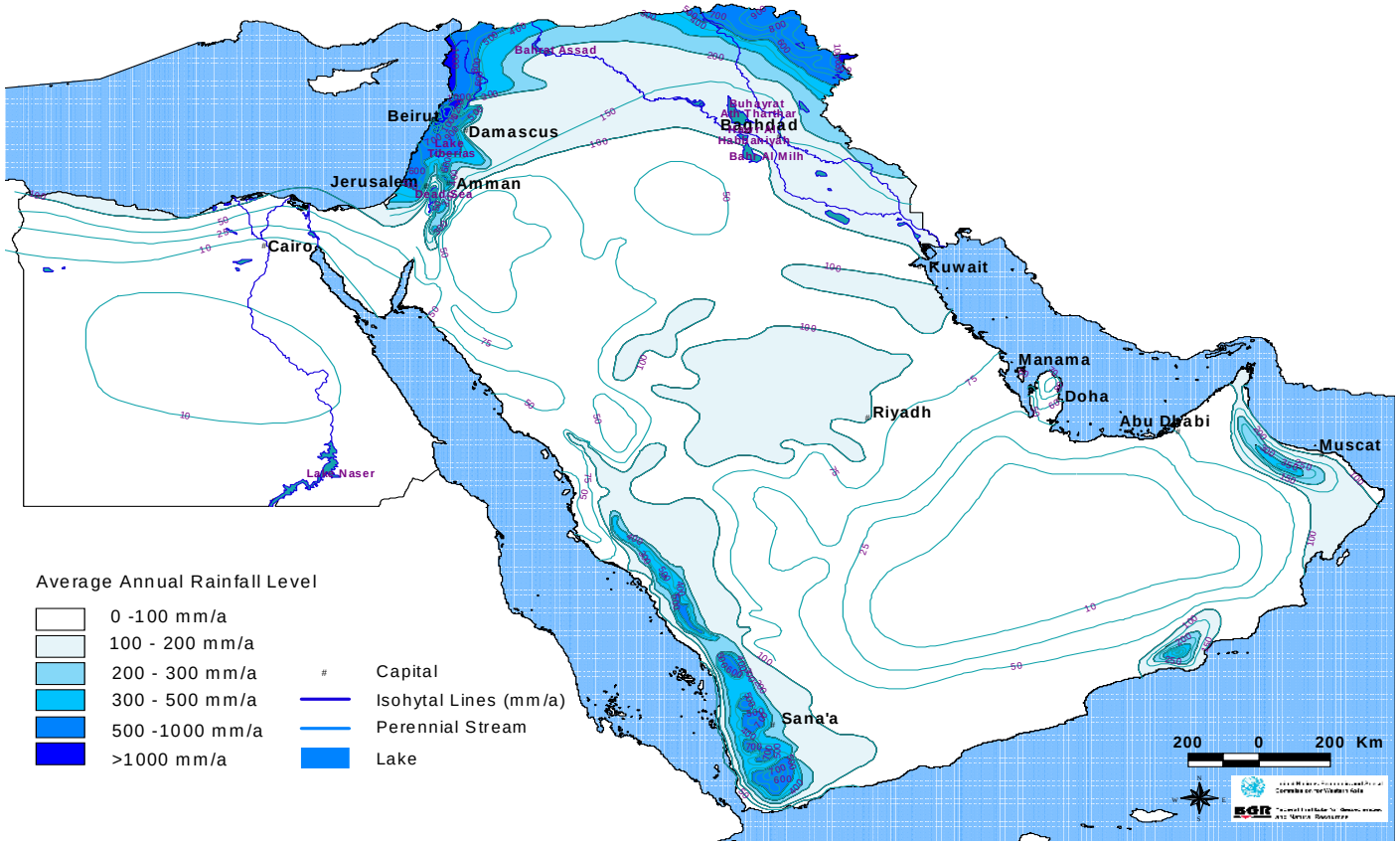
4. Type 4: Local or discontinuous sedimentary/alluvial basins limited mostly to the vicinity of tectonically active zones containing renewable groundwater with variable productivity and high potential for salinization; Miocene epoch to Quaternary period.

5. Type 5: Local or discontinuous volcanic basins related to the Red Sea-Dead Sea rift system containing renewable groundwater with variable productivity and high potential for salinization; Miocene epoch to Quaternary period.

6. Type 6: Localized zones in crystalline rocks and/or overlying sedimentary formations with no groundwater or very limited yields of groundwater of variable quality; intrusive and evaporitic rock.

It can also be seen from figure 4 that the large sedimentary basins extending across the region, namely, types 1 and 2, are shared by more than two ESCWA member countries.

Figure 3. Rainfall distribution in the ESCWA region
(*Annual average*)



Source: ESCWA and the Federal Institute for Geosciences and Natural Resources (BGR), GIS Databases on hydrogeological maps of the ESCWA member countries (CD-ROM).

Abbreviation: mm/a, millimetres per annum.

Figure 4. Aquifer systems in the ESCWA region

Source: ESCWA and the Federal Institute for Geosciences and Natural Resources (BGR), GIS Databases on hydrogeological maps of the ESCWA member countries (CD-ROM).

II. WATER RESOURCES AVAILABILITY

A. AVAILABILITY IN TERMS OF TOTAL VOLUME

1. *Conventional sources*

The total renewable water resources presently available from conventional sources are estimated at 165.5 billion m^3 per year; 90 per cent, or 148.6 billion m^3, is surface water, while the remaining 10 per cent, or 16.9 billion m^3, is groundwater, as illustrated in table 6. The estimate differs slightly from previous data of 150.8 billion m^3 per year surface water and 18.5 billion m^3 groundwater.[8] It is not clear whether the discrepancies are due to actual changes in the surface water/groundwater regimes, or due to the fact that the data were reported by different sources within the same country. Hence, the approach followed in this *Report* was to compare the data available from all sources, select the value judged the most accurate and adopt that in presentations and tables, including annex I. The most recent data received from official channels, usually CWR members acting as focal points in their respective countries, are also reported; thus giving CWR members the chance to compare and update the data they have with other official data, for example from the central statistical offices, and data published by international organizations, for example FAOSTAT of the Food and Agriculture Organization of the United Nations (FAO).

TABLE 6. TOTAL RENEWABLE WATER RESOURCES IN ESCWA MEMBER COUNTRIES
(*Millions of cubic metres per year*)

	Surface water (previous value)[a/]	Mean groundwater recharge[*] (previous value)[a/]	Surface water		Mean groundwater recharge[*]		Total renewable water resources (current value)[b/]
			(current value)[b/]	(*percentage*)	(current value)[b/]	(*percentage*)	
Bahrain	0.2	100.0	0.0	(0.0)	127.0	(100)	127.0
Egypt	55 500.0	4 100.0	55 500.0[**]	(97.6)	1 384.0	(2.4)	56 884.0
Iraq	70 370.0	2 000.0	72 651.6	(94.5)	4 228.4	(5.5)	76 880.0
Jordan	350.0	277.0	746.0	(60.0)	507.0	(40.0)	1 253.0
Kuwait	0.1	160.0	0.1	(0.06)	160.0	(99.9)	160.1[**]
Lebanon	2 500.0	600.0	2 200.0	(93.6)	150.0	(6.4)	2 350.0
Oman	918.0	550.0	918.0	(62.5)	550	(37.5)	1 468.0[**]
Palestine	30.0	185.0	0.0	(0.0)	679.0	(100.0)	679.0
Qatar	1.4	85.0	1.4	(1.6)	85.0	(98.4)	86.4[**]
Saudi Arabia	2 230.0	3 850.0	5 000.0	(62.5)	3 000.0	(37.5)	8 000.0
Syrian Arab Republic	16 375.0	5 100.0	9 880.0	(66.9)	4 898.0	(33.1)	14 779.0
United Arab Emirates	185.0	130.0	190.0	(59.6)	129.0	(40.4)	319.0
Yemen	2 250.0	1 400.0	1 500.0	(60.0)	1 000.0	(40.0)	2 500.0
ESCWA	150 834.0	18 537.0	148 587.1	(89.8)	16 897.4	(10.2)	165 485.5

Sources: a/ ESCWA, *Updating the Assessment of Water Resources in ESCWA Member Countries* (United Nations, New York, 2003); data for 1995-1999 compiled from various sources; b/ Latest data for 2005-2007.

[*] Replenishment of the groundwater system, which may include fresh, as well as brackish water.
[**] Previous values adopted as new national data need further investigation and confirmation.

2. *Non-conventional sources*

Details of non-conventional water resources produced in ESCWA member countries are shown in table 7. About half the total water resources from non-conventional sources are produced in Egypt and the

[8] ESCWA, *Updating the Assessment of Water Resources in ESCWA Member Countries* (United Nations, New York, 2003) E/ESCWA/ENR/1999/13.

Syrian Arab Republic alone. The bulk of that water is in the form of agricultural drainage available for reuse. The volume of agricultural drainage in those two countries is estimated at 7,500 million m^3 per year and 2,246 million m^3 per year, respectively. In Jordan and Yemen, over 90 per cent of non-conventional water for reuse is in the form of treated wastewater, while the GCC countries rely heavily on desalinated water as a supplementary source of freshwater. Desalination accounts for 88.7 per cent of the non-conventional water produced in Bahrain, 86.9 per cent in Kuwait, 78.9 per cent in Oman, 82.4 per cent in Qatar, 72.4 per cent in Saudi Arabia and 81.1 per cent in the United Arab Emirates.

TABLE 7. NON-CONVENTIONAL WATER RESOURCES IN ESCWA MEMBER COUNTRIES

	Total water resources from non-conventional sources (*million m^3/year*)	Desalinated water produced (*million m^3/year*)	Treated wastewater produced for reuse (*million m^3/year*)	Agricultural drainage produced for reuse (*million m^3/year*)	Desalinated water produced as a percentage of total non-conventional water resources (*percentage*)	Treated wastewater produced as a percentage of total non-conventional water resources (*percentage*)	Agricultural drainage produced as a percentage of non-conventional water resources (*percentage*)
Bahrain	134.2	119.0	15.0	0.2	88.7	11.2	0.1
Egypt	8 906.6	6.6	1 400.0	7 500.0	0.07	15.7	84.2
Iraq	1 820.0	..	450.0	..	..	24.7	..
Jordan	79.0	5.0	74.0	..	6.3	93.7	..
Kuwait	397.0	345.0	52.0	..	86.9	13.1	..
Lebanon	4.0	2.0	2.0	..	50.0	50.0	..
Oman	109.0	86.0	23.0	..	78.9	21.1	..
Palestine	0.0	0.0	0.0	0.0	..	..	..
Qatar	159.0	131.0	..	..	82.4	..	..
Saudi Arabia	1 450.0	1 050.0	360.0	40.0	72.4	24.8	2.8
Syrian Arab Republic	3 526.0	0.0	1 280.0	2 246.0	0.0	36.3	63.7
United Arab Emirates	1 242.5	1 008.0	234.5	0.0	81.1	18.9	0.0
Yemen	96.3	7.3	89	0.0	7.6	92.4	0.0
ESCWA	17 923.6	2 759.9	3 979.5	9 786.2			

Source: Data compiled by ESCWA.
Note: Two dots (..) indicate that data are not available.

B. AVAILABILITY IN TERMS OF PER CAPITA SHARE

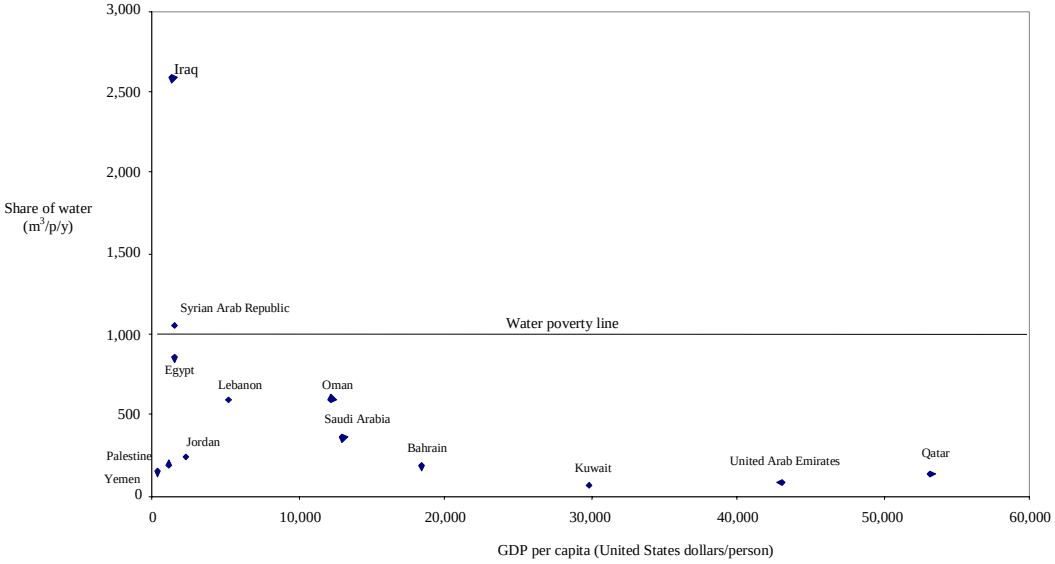
The per capita annual share from renewable water resources in ESCWA member countries is displayed in figure 5, and also in table 8. There is a significant difference between ESCWA member countries; from 2,578 m^3 per person per year in Iraq, to 71.7 m^3 per person per year in Kuwait. With the exception of Iraq and possibly the Syrian Arab Republic, the ESCWA member countries all fall below the "water poverty" line of 1,000 m^3 per person per year. However, significant volumes of freshwater are produced from non-conventional sources which, when compared with renewable resources, amount to 100 per cent and more in some countries. For example, the non-conventional water resources produced as a percentage of conventional water resources is about 248 per cent in Kuwait and 390 per cent in the United Arab Emirates, as shown in figure 6. Yet, water poverty conditions persist even when the currently produced supplementary water from non-conventional sources is considered, as illustrated in table 8, since the per capita share in all countries except Iraq and the Syrian Arab Republic still remains below 1,000 m^3 per person per year.

TABLE 8. COMPARISON OF PER CAPITA ANNUAL SHARE FROM RENEWABLE AND NON-CONVENTIONAL WATER RESOURCES
(*Cubic metres per year*)

	Per capita annual share from renewable water resources	Per capita annual share from non-conventional water resources	Total per capita annual share from available water resources
Bahrain	181.9	192.3	374.2
Egypt	851.0	133.2	984.3
Iraq	2 578.0	70.6	2 648.6
Jordan	234.0	14.8	248.8
Kuwait	71.7	162.5	234.2
Lebanon	594.5	1.1	595.5
Oman	598.9	44.5	643.4
Palestine	192.5	0.0	192.5
Qatar	139.8	257.3	396.3
Saudi Arabia	354.0	62.7	415.4
Syrian Arab Republic	1 056.7	190.7	1 247.4
United Arab Emirates	78.7	306.5	385.2
Yemen	145.7	5.6	151.3

Source: Data compiled by ESCWA.

Figure 5. Per capita annual share from renewable water resources by GDP per capita in ESCWA member countries

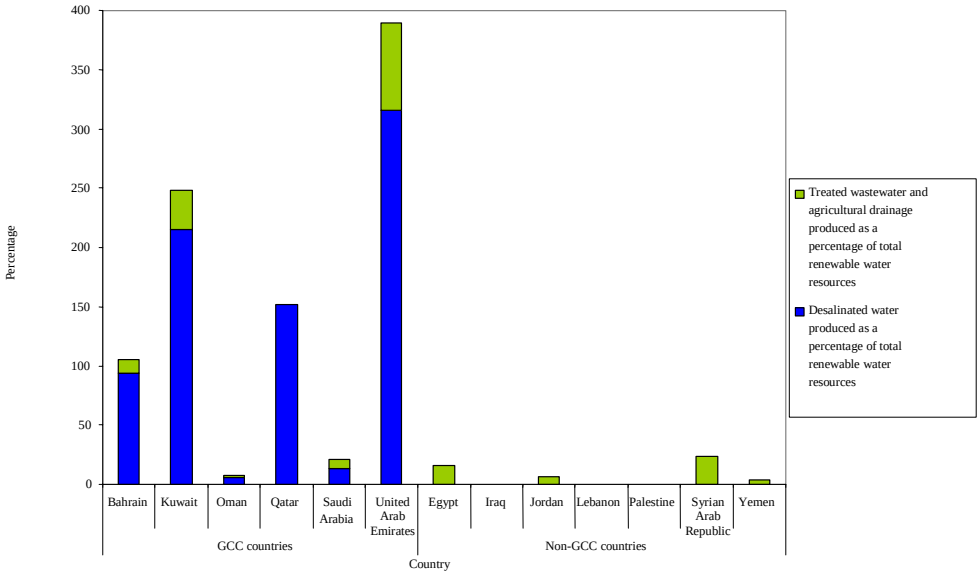


Source: Data compiled by ESCWA.

C. AVAILABILITY IN TERMS OF GOOD QUALITY WATER

The database currently available at ESCWA does not contain any indicators for water quality. For the purpose of this *Report*, a literature search was done, the results of which are presented in tables 9 and 10. The search indicates that there are wide differences in the quality of surface water and groundwater systems across the region, in terms of the total dissolved solids (TDS) and/or electrical conductivity (EC) and temperature. However, the available data are too limited for conclusions to be drawn; hence, it is suggested that EC and TDS be added to the list of indicators in future research and reporting.

Figure 6. Desalinated water, and treated and agricultural drainage as percentage of total renewable water resources in ESCWA member countries



Source: Data compiled by ESCWA.

TABLE 9. INDICATORS ON WATER QUALITY IN MAJOR RIVER SYSTEMS IN THE ESCWA REGION

River/wadi system	Sampling location	Electrical conductivity (EC) range (*µS/cm*)	Total dissolved solids (TDS) range (*milligrams/litre*)
Nile	Aswan		175-180
	Delta Barrage		200-210
Euphrates	Khabur tributary		470-975
	Husaybah	600-976 (average)	437 in 1976; 793 in 1990; 664 in 1993; 458 in 1995
Tigris	major tributaries		150-500
Asi (Orontes)	within Lebanon		190-950
	within the Syrian Arab Republic		400-930

Source: Compiled from ESCWA, *Updating the Assessment of Water Resources in ESCWA Member Countries*, (United Nations, New York, 2003).

Abbreviation: µS/cm, microSiemens per centimetre.

TABLE 10. INDICATORS ON WATER QUALITY IN MAJOR AQUIFER SYSTEMS IN THE ESCWA REGION

Aquifer	Riparian countries	Total dissolved solids (TDS) (*milligrams/litre*)	Description
Saq and Tabuk (Type 1; Palaeozoic sandstone)	Jordan Saudi Arabia Syrian Arab Republic		Good water quality; however, high salinity in deep water aquifers presents a threat to the superficial levels of the aquifer
Wajid (Type 1; Paleozoic sandstone)	Saudi Arabia Yemen	740 (average)	Freshwater; however, the temperature could reach 55°C
Minjur (Type 1; Mesozoic sandstone)	Saudi Arabia (not shared aquifer)	20 000	In some cases there is flowing water; salinity is the highest ever reported in Saudi Arabia

TABLE 10 (*continued*)

Aquifer	Riparian countries	Total dissolved solids (TDS) (*milligrams/litre*)	Description
Wasia'a-Bayad (Type 1; Mesozoic sandstone)	Bahrain Kuwait Oman Qatar Saudi Arabia United Arab Emirates Yemen	900-10 000	Supplies water to many cities and villages; TDS range is wide; thus, in many cases water quality is a limiting factor in using this aquifer
Nubian sandstone (Type 1; Palaeozoic to Mesozoic sandstone)	Egypt Chad (hypersaline) Libyan Arab Jamahiriya The Sudan	500-1 000 (upper unconfined layers) 2 000-100 000 (lower semi-confined to confined)	One of the most important aquifers in North Africa because of the amount of freshwater it produces; however, there are indicators on the presence of salty water in parts near coastal areas, especially in deeper layers which contain hypersaline water
Jabal al Arab basalt aquifer (Type 5; Tertiary to Quaternary)	Jordan Syrian Arab Republic		Generally freshwater; hot springs emanating from deep layers mix with shallow aquifer zones and limit their use because of high salinity and/or temperature
Harrat basalt aquifer (Type 5; Tertiary to Quaternary)	Saudi Arabia (i.e. not shared aquifer)		
Yemen trap volcanic rock (Tertiary to Quaternary; type 5 rock)	Yemen (i.e. not shared aquifer)		
Umm Ar-Rudhuma (Type 2; Mesozoic carbonates)	Bahrain Iraq Jordan Kuwait Oman Qatar Saudi Arabia Syrian Arab Republic United Arab Emirates Yemen	Generally <1 000-2 000	In the east and north, close to the discharge locations, TDS reaches 15 000 milligrams per litre
Dammam (Type 2; Mesozoic and Tertiary carbonates)	Bahrain Iraq Kuwait Oman Qatar Saudi Arabia United Arab Emirates	>6 000	Medium to high salinity increasing towards the east and south
Ajlun in Jordan Cenomanian-Turonian-Eocene in the Syrian Arab Republic Lebanon (Type 2; Mesozoic and Tertiary carbonates)	Jordan Lebanon Syrian Arab Republic	150-900 (Lebanon-Syrian Arab Republic) 500-3 500 (Jordan)	

Sources: Data compiled from ESCWA, *Updating the Assessment of Water Resources in ESCWA Member Countries* (United Nations, New York, 2003); and ESCWA, *Guidelines for the Development of a Manual on Groundwater Management in ESCWA Member Countries in the Context of Integrated Water Resources Management* (United Nations, New York, 2003) (in Arabic).

III. LAND AND WATER RESOURCES USE

A. WATER RESOURCES USE

The distribution of sectoral water and details on use in ESCWA member countries is depicted in figure 7 and table 11. The total per capita annual consumption in the three main sectors, namely, domestic, agricultural and industrial, ranges from 1,890.5 m^3 per person per year in Iraq to 83 m^3 per person per year in Palestine. Details on the sectoral consumption are given in the following sections.

TABLE 11. INDICATORS ON USE OF WATER RESOURCES IN ESCWA MEMBER COUNTRIES
(*Cubic metres per person per year*)

	Per capita domestic water use	Per capita agricultural water use	Per capita industrial water use	Total per capita water use
Bahrain	208.5	240.6	29.4	478.5
Egypt	74.3	914.3	118.6	1 107.3
Iraq	155.2	1 629.7	105.5	1 890.5
Jordan	52.1	101.6	7.0	160.8
Kuwait	160.0	6.5	11.6	178.2
Lebanon	124.9	227.7	37.9	390.6
Oman	83.1	458.5	7.7	549.3
Palestine	36.7	43.2	3.2	83.1
Qatar	111.6	131.0	10.6	253.2
Saudi Arabia	90.8	757.9	27.7	876.4
Syrian Arab Republic	78.7	845.3	32.9	956.9
United Arab Emirates	238.5	484.1	15.2	737.7
Yemen	11.7	183.5	2.9	198.1

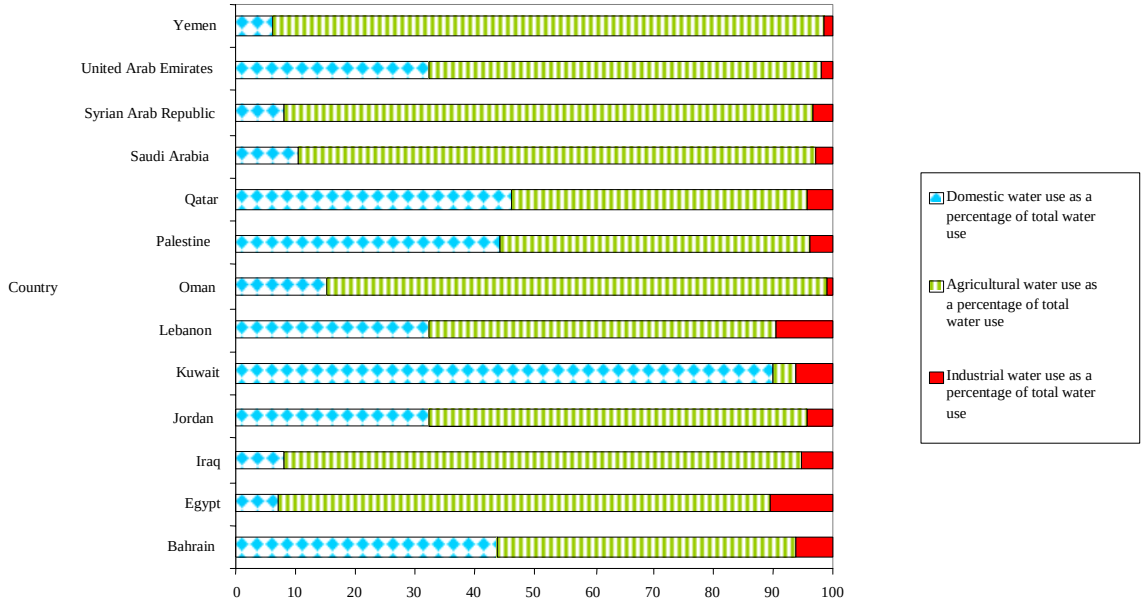
Source: Data compiled by ESCWA.

1. *Domestic water use*

Total domestic water use in the ESCWA region is estimated at 15.1 billion m^3, and is expected to reach 24 billion m^3 in the year 2025, as illustrated in table 12. Egypt and Iraq, where about half the region's population live, as shown in figure 8, presently account for 57 per cent of the total domestic water use, namely, 26 and 31 per cent, respectively. That trend is expected to persist until the year 2025, as shown in table 12 and figure 10. Domestic water use in Yemen, in terms of consumption per person per year and total use, is much lower than in Saudi Arabia and the Syrian Arab Republic, although those three countries have approximately the same population size.

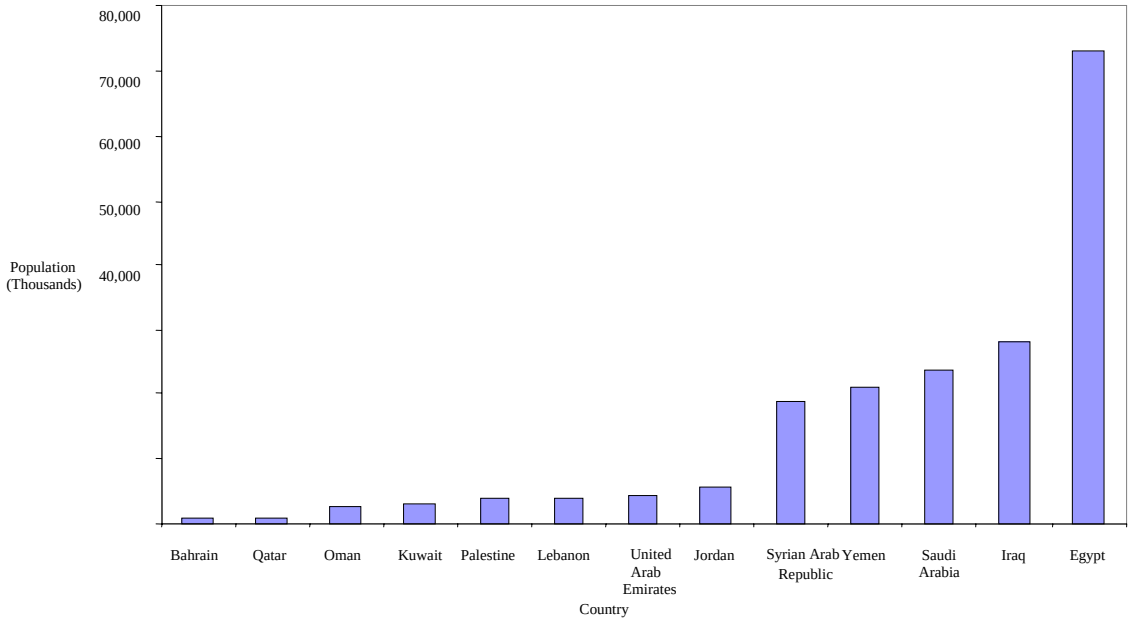
Figure 9 shows that there is a wide range in the per capita water use for domestic purposes, from 238.5 m^3 per person per year in the United Arab Emirates to 11.7 m^3 per person per year in Yemen. It can also be seen that the GCC countries, dominated by urban populations depending mainly on non-conventional sources, have generally high per capita domestic water use. The two GCC countries that still depend heavily on conventional renewable water resources, namely, Oman and Saudi Arabia, have relatively lower per capita consumption than the remaining GCC countries. Table 12 indicates that domestic water use in Egypt, Iraq and the Syrian Arab Republic, as well as Yemen, where the rural population constitutes 50 per cent or more, as illustrated in table 5, represents only about 6 to 8 per cent of total water use.

Figure 7. Water use by sector in ESCWA member countries



Source: Data compiled by ESCWA.

Figure 8. Population in ESCWA member countries (2005)



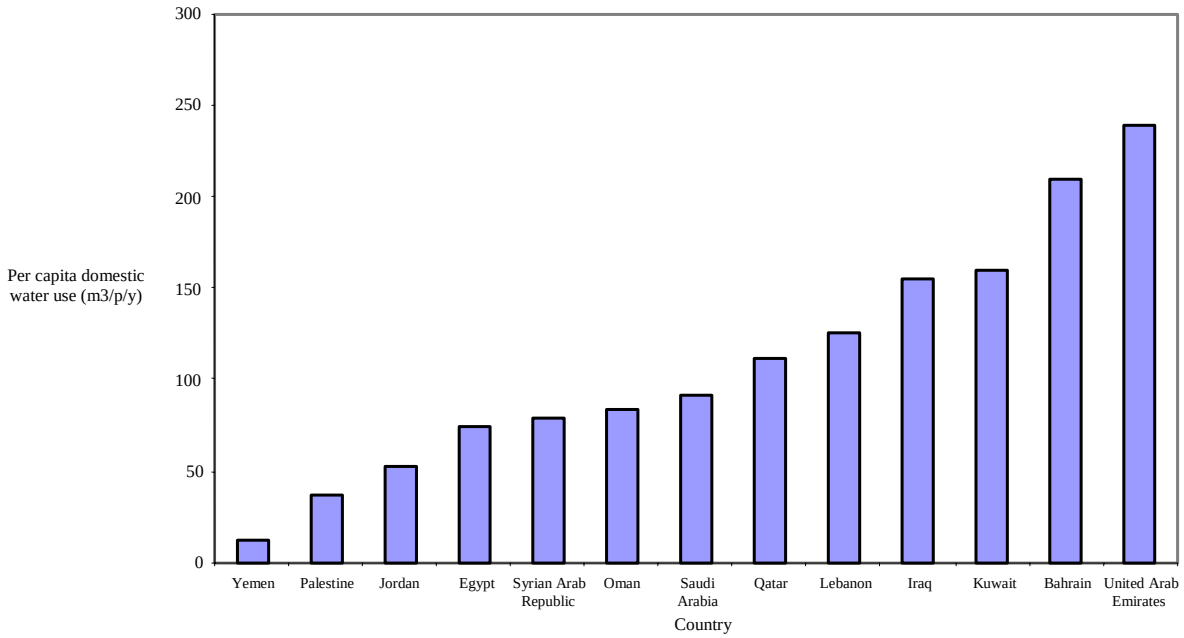
Sources: United Nations Department of Economic and Social Affairs Population Division, *World Population Prospects: The 2004 Revision*, available at: http://www.un.org/esa/population/publications/WPP2004/wpp2004.htm; and *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

TABLE 12. DOMESTIC WATER USE FOR 2005, WITH PROJECTIONS TO 2025

	Per capita domestic water use (*m^3/person/year*)	Domestic water use as a percentage of total water use (*percentage*)	Total domestic use in 2005 (*million m^3*)	Projected domestic use in 2025 (*million m^3*)
Bahrain	208.5	43.6	139.1	204.4
Egypt	74.3	6.7	4 700.0	7 396.3
Iraq	155.2	8.2	4 000.0	6 749.3
Jordan	52.1	32.4	281.0	421.9
Kuwait	160.0	89.8	405.5	642.3
Lebanon	124.9	32.3	500.0	606.9
Oman	83.1	15.1	205.0	302.8
Palestine	36.7	44.2	125.0	241.9
Qatar	111.6	45.9	80.0	123.6
Saudi Arabia	90.8	10.4	2 100.0	3 178.3
Syrian Arab Republic	78.7	8.2	1 453.0	2 181.2
United Arab Emirates	238.5	32.3	943.0	1 500.2
Yemen	11.7	5.9	145.0	429.2
ESCWA			15 076.6	23 978.3

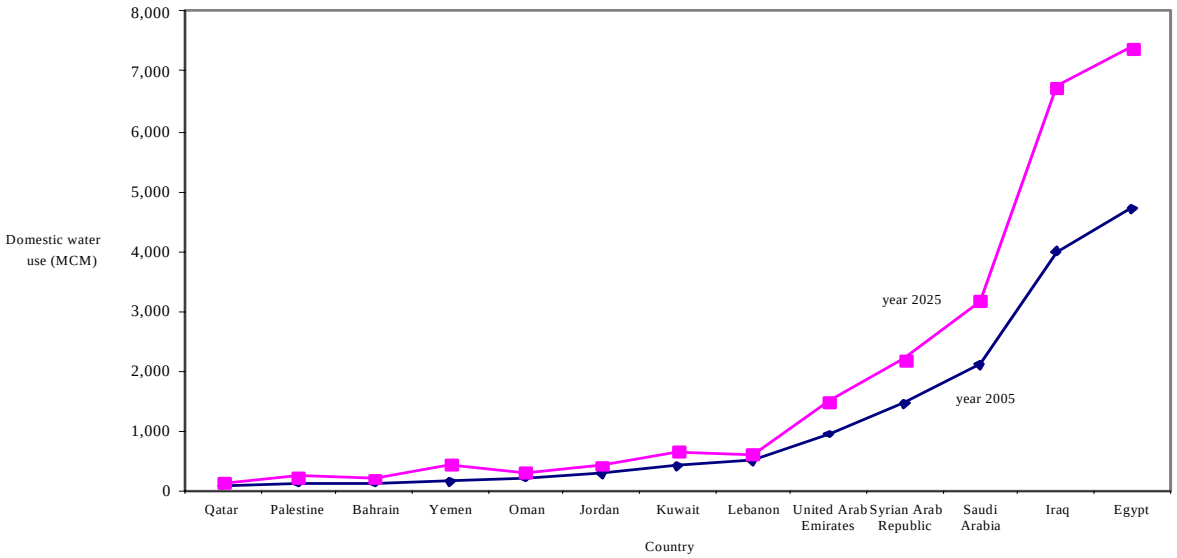
Source: Data compiled by ESCWA.

Figure 9. Per capita domestic water use in ESCWA member countries



Source: Data compiled by ESCWA.

Figure 10. Domestic water use for year 2005 and the projected values for year 2025 in ESCWA member countries



Source: Data compiled by ESCWA.

2. *Agricultural water use*

The per capita agricultural water use ranges widely from 6.5 m^3 per person per year in Kuwait, to about 1,630 m^3 per person per year in Iraq, as displayed in figure 11 and table 13. Since the recommended per capita agricultural water requirement in arid and semi-arid environments is approximately 1,000 m^3 per person per year,[9] all ESCWA member countries, with the exception of Iraq, are presently using significantly less water than required for growing enough food. In terms of percentage, agricultural water use represents 3.7 per cent of total water use in Kuwait and 93 per cent in Yemen, with the remaining countries falling mainly between 50 and 88 per cent. Total agricultural water use in the region is estimated at about 141 billion m^3, with over 70 per cent being consumed in Egypt and Iraq alone.

Agricultural water use represents about 60 per cent or less of the total use of water in Bahrain, Jordan, Lebanon, Palestine and the United Arab Emirates, where freshwater from natural sources and/or cultivable land may be limited. Countries with relatively abundant surface water from perennial rivers, namely, Egypt, Iraq and the Syrian Arab Republic, or seasonal flash floods and/or cultivable land, namely Oman, Saudi Arabia and Yemen, consume over 75 per cent of their water in the agricultural sector. The economic return from that sector is generally very poor in most countries, less than 10 per cent, as shown in figure 11. The situation is slightly better in Yemen at 14 per cent, Egypt at 15.5 per cent and the Syrian Arab Republic at 24.4 per cent. However, the agricultural gross domestic product (GDP) is still less than 30 per cent of the total GDP in those countries. Agricultural economic efficiency, defined by the Arab Monetary Fund (AMF) in 2006 as "the agricultural GDP divided by agricultural work labour force",[10] has been less than 1.0 since 1995 in all ESCWA member countries except Iraq and Lebanon, as shown in figure 12. That indicates that productivity of the workforce in the agricultural sector is very low, particularly in Egypt, the Syrian Arab Republic and Yemen, where agricultural GDP is relatively high. A possible explanation for that could be the availability of cheap labour from local rural populations in those countries.

[9] Stockholm International Water Institute (SIWI), *Report 10: Water and Development in the Developing Countries* (SIWI, Stockholm, 2000).

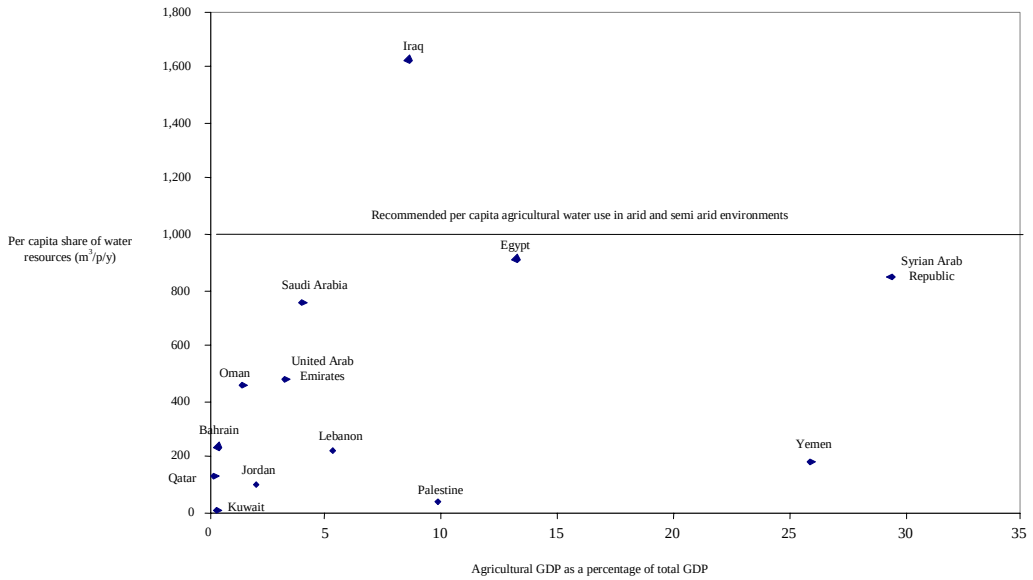
[10] Arab Monetary Fund (AMF), Arab Fund for Economic and Social Development (AFESD), League of Arab States, Organization of Arab Petroleum Exporting Countries (OAPEC), *Joint Arab Economic Report* (September 2006) (in Arabic) p. 271.

TABLE 13. AGRICULTURAL WATER USE AND PRODUCTIVITY

	Per capita agricultural water use (m^3/*person/year*)	Agricultural water use as a percentage of total water use (*percentage*)	Total agricultural water use (*million* m^3/*year*)	Agricultural GDP as a percentage of total GDP (*percentage*)	Agricultural economic efficiency (*percentage*)
Bahrain	240.6	50.3	160.5	0.4	0.6
Egypt	914.3	82.6	57 800.0	13.2	0.5
Iraq	1 629.7	86.2	42 000.0	8.6	1.1
Jordan	101.6	63.2	548.0	2.0	0.2
Kuwait	6.5	3.7	16.6	0.3	0.3
Lebanon	227.7	58.1	900.0	5.3	2.7
Oman	458.5	83.5	1 131.0	1.4	0.1
Palestine	43.2	51.9	147.0	9.8	..
Qatar	131.0	49.8	90.1	0.2	0.2
Saudi Arabia	757.9	86.5	17 530.0	4.0	0.5
Syrian Arab Republic	845.3	88.3	15 608.0	29.4	0.9
United Arab Emirates	484.1	65.6	1 914.0	3.3	0.6
Yemen	183.5	92.6	3 150.0	25.9	0.3
ESCWA			140 995.2		

Source: Data compiled by ESCWA.
Note: Two dots (..) indicate that data are not available.

Figure 11. Agricultural GDP as a percentage of total GDP by per capita share of water resources in ESCWA member countries

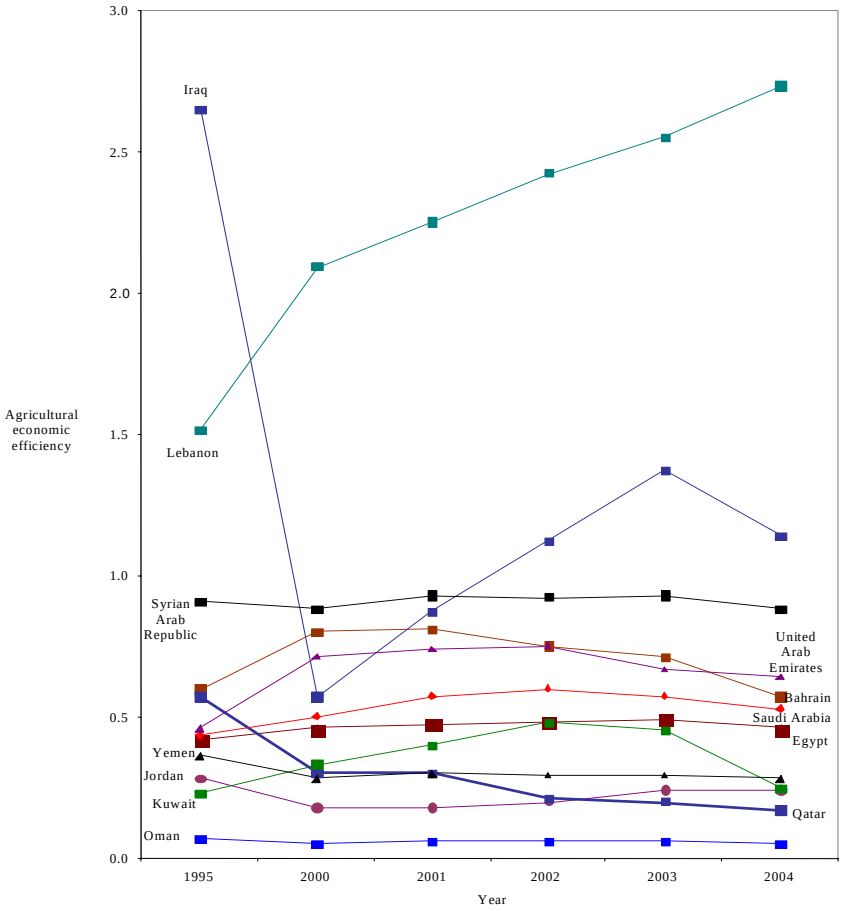


Source: Data compiled by ESCWA.

3. *Industrial water use*

A total of 11.9 billion m^3 of water is presently being used by the industrial sectors across ESCWA member countries, with over 85 per cent of that water being consumed in Egypt and Iraq, as shown in table 14. In all ESCWA member countries, with the exception of Egypt, the proportion of water used in the industrial sector, compared with the domestic and agricultural sectors, is smaller than the domestic and agricultural sectors. In Egypt, 10.7 per cent of total water use is consumed by industry, as compared with 6.7 per cent for domestic use. It is noticed that while the per capita use in Egypt and Iraq is comparable in terms of percentage of total water use, in Iraq it represents only half of what it represents in Egypt.

Figure 12. Agricultural economic efficiency in ESCWA member countries



Source: Arab Monetary Fund (AMF), Arab Fund for Economic and Social Development (AFESD), League of Arab States, Organization of Arab Petroleum Exporting Countries (OAPEC), *Joint Arab Economic Report* (September 2006) (in Arabic).

TABLE 14. INDUSTRIAL WATER USE

	Industrial water use (*million m^3/year*)	Per capita industrial water use (m^3/*person/year*)	Industrial water use as a percentage of total water use (*percentage)*
Bahrain	19.6	29.4	6.1
Egypt	7 500.0	118.6	10.7
Iraq	2 720.0	105.5	5.6
Jordan	38.0	7.0	4.4
Kuwait	29.5	11.6	6.5
Lebanon	150.0	37.9	9.7
Oman	19.0	7.7	1.4
Palestine	11.0	3.2	3.9
Qatar	7.9	10.6	4.4
Saudi Arabia	640.0	27.7	3.2
Syrian Arab Republic	608.0	32.9	3.4
United Arab Emirates	60.0	15.2	2.1
Yemen	50.0	2.9	1.5
ESCWA	11 853.0		

Source: Data compiled by ESCWA.

B. LAND USE

The total area of the ESCWA region is estimated at 4.93 million km^2, or 493.180 x 10^6 hectares (ha), according to the latest information available from the member countries, as displayed in table 15. Cultivable land, namely, agricultural land suitable for cultivation, is 92.33 x 10^6 ha, representing 18.7 per cent of the total area; while the land area that is actually cultivated is only 21.9 x 10^6 ha and represents 4.4 per cent of the total area. Almost half the cultivated land is irrigated, which means that irrigated land represents 2.2 per cent of the total available land in the region.

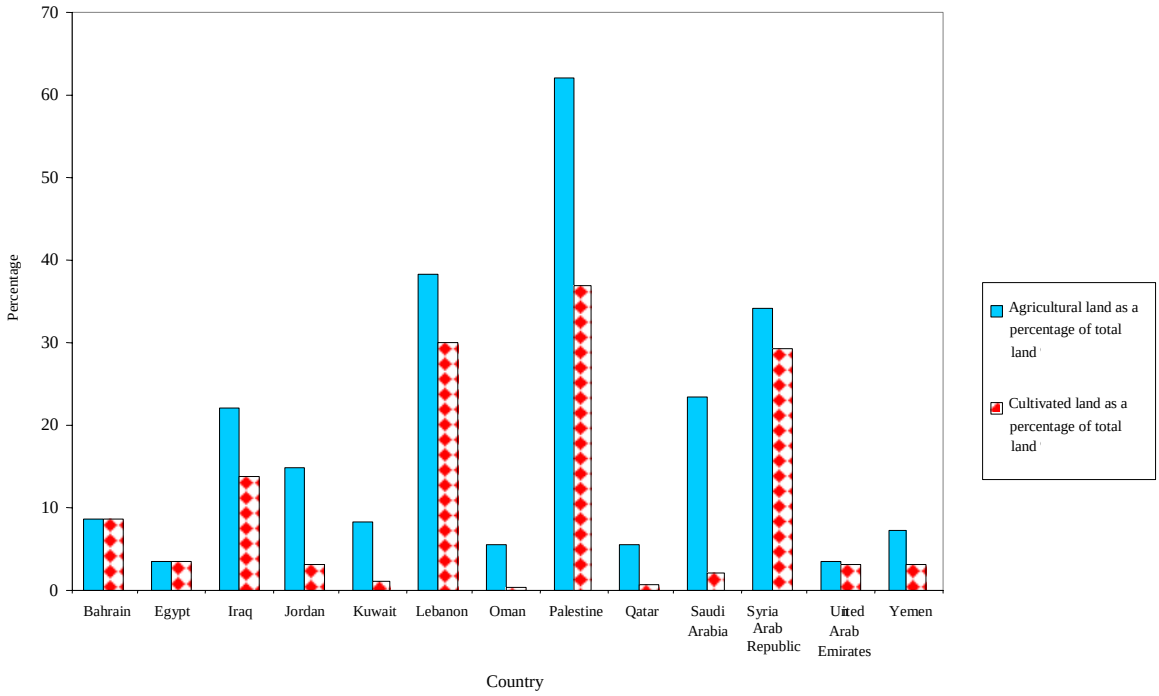
Egypt and Saudi Arabia account for two thirds, or 66 per cent, of the region's total land area, with 20.4 per cent and 45.6 per cent, respectively. However, there are significant differences in land use between those two countries. Cultivable land in Egypt represents only 3.5 per cent, all of which is cultivated; while 23 per cent of land in Saudi Arabia is cultivable, but only less than 2 per cent is cultivated, as illustrated in figure 13. The situation in the remaining ESCWA member countries falls in between those two extremes. Cultivable land in other GCC countries and in Yemen is less than 10 per cent, with a large proportion not being cultivated. The exceptions are Bahrain and the United Arab Emirates, where almost all agricultural land is being cultivated. The proportion of agricultural land in the remaining countries, namely, Iraq, Jordan, Lebanon, Palestine and the Syrian Arab Republic, is significantly higher, ranging from 15 per cent in Jordan to 62 per cent in Palestine. A large portion of the agricultural land in those counties is being cultivated, except in Jordan where cultivated land represents only 20 per cent of the agricultural land, as illustrated in figure 13. In terms of irrigated land, Egypt is the exception in the sense that practically all agricultural land available is irrigated land, as illustrated in table 15. All other ESCWA member countries are presently irrigating only about one third or less of their agricultural land; the exception being Bahrain, where 66.7 per cent of the agricultural land is under irrigation.

TABLE 15. LAND USE IN ESCWA MEMBER COUNTRIES

	Total land (*10^3 hectares*)	Cultivable (agricultural) land (*10^3 hectares*)	Cultivated land (*10^3 hectares*)	Irrigated land (*10^3 hectares*)	Irrigated land as a percentage of cultivable land (*percentage*)
Bahrain	71.2	6.0	6.0	4.0	66.7
Egypt	100 144.9	3 520.0	3 520.0	3 422.0	97.2
Iraq	43 831.7	9 623.0	6 019.0	3 525.0	36.6
Jordan	8 934.2	1 324.0	270.0	75.0	5.7
Kuwait	1 781.8	144.0	18.0	13.0	9.0
Lebanon	1 040.0	399.0	313.0	104.0	26.1
Oman	30 950.0	1 702.0	80.0	72.0	4.2
Palestine	602.0	373.0	222.0	15.0	4.0
Qatar	1 149.3	61.0	21.0	13.0	21.3
Saudi Arabia	225 000.0	64 488.0	3 798.0	1 620.0	2.5
Syrian Arab Republic	18 518.0	6 436.0	5 742.0	1 333.0	20.7
United Arab Emirates	8 360.0	559.0	254.0	76.0	13.6
Yemen	52 797.0	3,693	1 669.0	550.0	14.9
ESCWA	493 180.1	92 328.0	21 932.0	10 822.0	

Source: Data compiled by ESCWA.

Figure 13. Agricultural and cultivated lands as a percentage of total land in ESCWA member countries



Source: Data compiled by ESCWA.

IV. DEPENDENCY AND ACCESSIBILITY

A. DEPENDENCY

1. *In terms of surface water and groundwater resources*

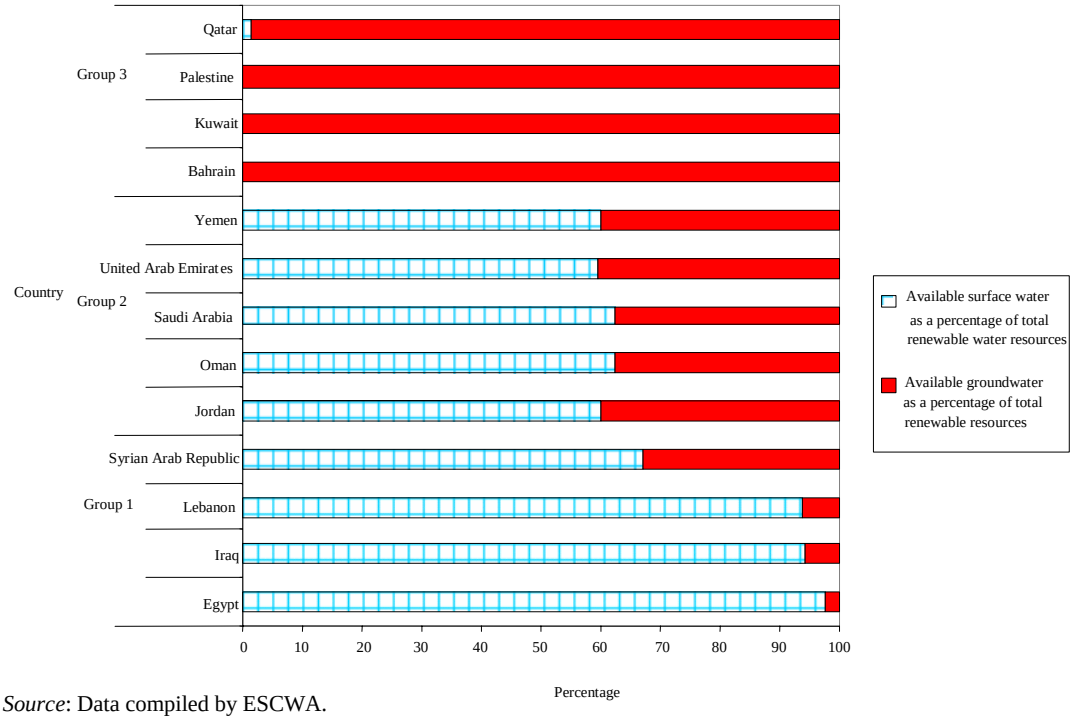
Groundwater, despite being significantly less than surface water in terms of volume, remains a common source of water to many countries in the region. Figure 14 shows that ESCWA member countries can be grouped into three categories, also illustrated in table 6. They are set forth as follows:

(a) Group 1: Countries in which surface water constitutes the primary conventional source for freshwater, as it represents over 70 per cent of the renewable water resources, namely: Egypt, Iraq, the Syrian Arab Republic and Lebanon. They are countries with perennial rivers;

(b) Group 2: Countries in which groundwater constitutes at least one third of the total volume obtained from conventional sources, though surface water remains the primary source, namely: Oman, Saudi Arabia, Jordan, the United Arab Emirates and Yemen. They are characterized by perennial rivers or wadi systems with seasonal flash floods, the exception being the Syrian Arab Republic which is traversed by the Tigris-Euphrates systems;

(c) Group 3: Countries in which the only conventional source of freshwater is groundwater, namely: Bahrain, Kuwait, Palestine and Qatar.

Figure 14. Available surface and groundwater as a percentage of total renewable water resources in ESCWA member countries



Source: Data compiled by ESCWA.

2. *In terms of internal and external water resources*

Only 20 million m^3 of renewable water resources are available to Kuwait, and the total volume comes entirely from conventional sources outside its political boundary, as indicated in table 16. Kuwait relies mainly on non-conventional sources for its freshwater supply. Bahrain and Egypt are also practically

dependent on external sources for renewable water resources, with a dependency ratio of 96.6 per cent and 96.9 per cent, respectively. Bahrain, like other GCC countries, relies largely on non-conventional sources for its domestic needs, while Egypt is totally dependent on the River Nile originating outside its boundary for the existence of its large population. The Syrian Arab Republic is also heavily dependent on external sources for its freshwater supply, with the dependency ratio being 80.3 per cent. To a lesser extent, so are Iraq and Jordan, with a dependency ratio of 53.3 per cent and 22.7 per cent, respectively. Like Egypt, those three countries are characterized by major river systems that originate outside their political boundaries, hence their significant dependency on surface water from those systems. Dependency on internationally shared water resources is particularly important for Egypt, Iraq and the Syrian Arab Republic because of the substantial volumes of freshwater from external sources. Lebanon is the only country that does not depend on external sources for the supply of any freshwater; in fact, it loses some of its freshwater to neighbouring countries. Table 16 also indicates that Oman, Saudi Arabia, the United Arab Emirates and Yemen have zero dependency on external water resources.

TABLE 16. DEPENDENCY RATION ON EXTERNAL RENEWABLE WATER RESOURCES

	Internal resources (*million m^3/year*)				External resources (*million m^3/year*)	Total renewable water resources (*million m^3/year*)	Dependency ratio (*percentage*)
	Surface water	Groundwater	Overlap	Total internal renewable water resources	Total external renewable (actual)		
Bahrain	4	0	0	4	112	116	96.6
Egypt	500	1 300	0	1 800	56 500	58 300	96.9
Iraq	34 000	1 200	0	35 200	40 200	75 400	53.3
Jordan	400	500	220	680	200	880	22.7
Kuwait	0	0	0	0	20	20	100.0
Lebanon	4 100	3 200	2 500	4 800	-390	4 410	0.8
Oman	930	955	900	985	0	985	0.0
Palestine	..	..	..	..	..	..	..
Qatar	1	50	0	51	2	53	3.8
Saudi Arabia	2 200	2 200	2 000	2 400	0	2 400	0.0
Syrian Arab Republic	4 800	4 200	2 000	7 000	19 300	26 300	80.3
United Arab Emirates	150	120	120	150	0	150	0.0
Yemen	4 000	1 500	1 400	4 100	0	4 100	0.00

Source: FAO, Aquastat Database Query, available at: http://www.fao.org/nr/water/aquastat/data/query/index.html.
Note: Two dots (..) indicate that data are not available.

B. ACCESSIBILITY

The entire urban populations in five of the GCC countries, namely, Bahrain, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates, and in Egypt have access to improved drinking water, as illustrated in table 17. Oman is the only GCC country where almost half the urban population is still without improved drinking water supply. Accessibility of urban populations to improved drinking water in the remaining ESCWA member countries ranges from 65 per cent for Lebanon, 67 per cent for Iraq, 74 per cent for Yemen, 95 per cent for Palestine, to 98 per cent for Jordan and the Syrian Arab Republic. The situation is somehow different for the rural population. The only ESCWA member countries where all rural populations have access to improved drinking water are Bahrain, Qatar and the United Arab Emirates. For the remaining countries, the values range from 93 per cent for Jordan to 13 per cent for Iraq.

The situation is slightly different for sanitation services, where 100 per cent accessibility for urban population is reported by Iraq, Kuwait, Palestine, Qatar and the United Arab Emirates. The level of services in the remaining countries ranges from a high of 98 per cent for Oman, to 38 per cent for Egypt. It is noticed that the coverage of sanitation services in Oman is significantly higher than water supply coverage, which is

rather unusual. However, those values were confirmed by the Directorate General of Water Resources Assessment in Oman.[11] In almost all other countries analysed in this *Report*, the level of sanitation services to the rural population is significantly lower than for urban population.

TABLE 17. ACCESSIBILITY INDICATORS
(*Percentage*)

	Per capita use of freshwater resources (m^3/*person/year*)	Groundwater abstracted as a percentage of total water resources used	Urban population with access to improved drinking water	Rural population with access to improved drinking water	Total population with access to improved drinking water	Urban population with access to improved sanitation	Rural population with access to improved sanitation	Total population with access to improved sanitation
Bahrain	478.6	72.7	100.0	100.0	100.0	74.0	..	70.0
Egypt	1 107.3	9.8	100.0	43.0	67.2	38.0	40.0	68.3
Iraq	1 890.5	2.1	67.0	13.0	49.6	100.0	..	67.0
Jordan	160.8	57.8	98.0	93.0	97.0	71.0	4.0	56.0
Kuwait	178.2	89.7	100.0	..	100.0	100.0	..	100.0
Lebanon	390.6	15.5	65.0	31.0	65.0	50.0	10.0	44.6
Oman	549.3	84.9	53.0	21.0	21.0	98.0	67.0	89.2
Palestine	83.1	425.4	95.0	76.0	83.0	100.0	0.0	30.0
Qatar	253.2	..	100.0	100.0	100.0	100.0	100.0	100.0
Saudi Arabia	876.4	68.7	100.0	64.0	95.0	90.0	40.0	89.0
Syrian Arab Republic	956.9	47.2	98.0	85.0	90.0	87.0	65.0	70.0
United Arab Emirates	737.7	76.3	100.0	100.0	100.0	100.0	100.0	100.0
Yemen	198.1	65.4	74.0	68.0	69.0	89.0	21.0	38.0

Source: Data compiled by ESCWA.
Note: Two dots (..) indicate that data are not available.

C. SUSTAINABILITY

Sustainability of water resources in the ESCWA member countries is assessed indirectly via three indicators, which are used for evaluating the "water poverty" level, namely, groundwater use intensity,[12] water deficit,[13] and water stress.[14] ESCWA member countries, with the exception of Iraq, Jordan and Oman, are seriously overdrafting their aquifer systems, namely, over 100 per cent use. The highest groundwater use intensity is in the United Arab Emirates with 1,725 per cent, as illustrated in table 18, where total groundwater abstraction is more than an order of magnitude higher than the annual recharge. Groundwater use intensity in Egypt and Saudi Arabia, with 507.4 and 464.7 per cent, respectively, is also most alarming considering that groundwater contained in major aquifer systems in those two countries is almost entirely fossil water; in other words, there is no significant replenishment at the present time. The situation in Palestine is also alarming, but for a different reason. The total volume of water abstracted from the aquifers in Gaza and the West Bank is 1,204 million m^3 per year, of which only 251 million m^3 are allocated to the Palestinians. The latter value represents only 37 per cent of the recharge and, hence, does not constitute an overdraft. However, when the total volume of water abstracted is considered, however, there is a overdraft of 77 per cent apparently caused by Israel using the aquifer system in Palestine.

[11] Email received 8 October 2007 from the Ministry of Regional Municipalities and Water Resources, previously the Ministry of Regional Municipalities, Environment and Water Resources.

[12] Groundwater use intensity is the percentage ratio of total groundwater abstraction to mean annual groundwater recharge.

[13] Water deficit is the difference between per capita annual share from conventional water resources and per capita use of freshwater, expressed in m^3 per person per year.

[14] Water stress is defined as hundreds of persons per unit flow, arrived at by dividing 10,000 by per capita availability of freshwater; one unit flow is one million m^3 of renewable water.

Groundwater overdraft is a significant factor in the development of the overall national water deficit, which is a measure of the present total freshwater needs as compared with the per capita water share from renewable water resources. Figure 15 indicates that eight ESCWA member countries have a water deficit, namely, Bahrain, Egypt, Kuwait, Qatar, Palestine, Saudi Arabia, the United Arab Emirates and Yemen; while five have no water deficit, namely, Iraq, Jordan, Lebanon, Oman and the Syrian Arab Republic. In terms of water stress, ESCWA member countries can be divided into four groups, as set forth as follows:

(a) Countries with critical water stress,[15] namely, Kuwait and the United Arab Emirates;

(b) Countries with serious water stress,[16] namely, Bahrain, Iraq, Palestine, Qatar and Yemen;

(c) Countries with significant water stress,[17] namely, Jordan and Saudi Arabia;

(d) Countries with slight water stress,[18] namely, Egypt, Lebanon, Oman and the Syrian Arab Republic.

TABLE 18. WATER POVERTY INDICATORS

	Groundwater use intensity (*percentage*)	Water deficit (m^3*/person/year*)	Water stress (*100 persons/unit flow*)**
Bahrain	182.6	-296.6	55.0
Egypt	507.4	-256.3	11.8
Iraq	23.6	687.5	3.9
Jordan	98.8	73.2	42.7
Kuwait	253.1	-106.4	139.4
Lebanon	160.0	203.9	16.8
Oman	209.1	49.7	16.7
Palestine	177.3*	109.3	52.0
Qatar	217.6	-113.4	71.5
Saudi Arabia	464.7	-522.4	28.2
Syrian Arab Republic	170.3	99.8	9.5
United Arab Emirates	1 725.6	-659.0	127.1
Yemen	240.0	-52.4	68.6

Source: Data compiled by ESCWA.

* The total amount of water abstracted in Palestine is 1,204 million m^3 per year (groundwater intensity 177.3 per cent), of which only 251 million m^3 per year is allocated for Palestinians (groundwater intensity 37 per cent), while the remaining 953 million m^3 per year is consumed in Israel.

** One unit flow is one million m^3 of renewable water.

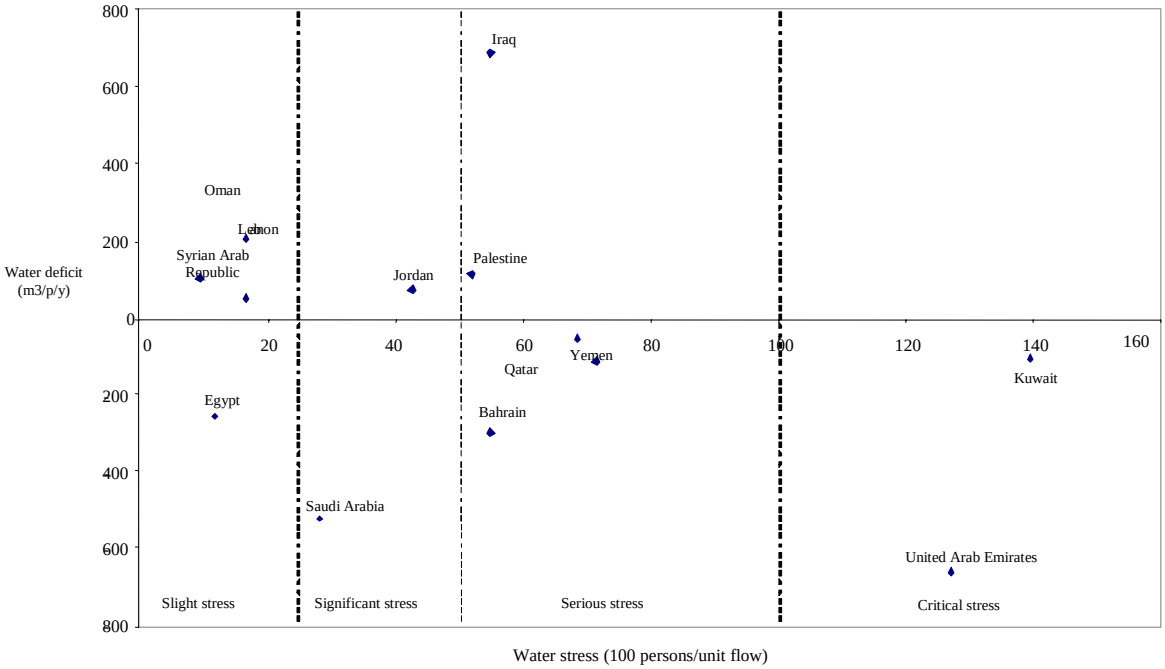
[15] More than 10,000 persons per unit flow.

[16] Between 5,000 and 10,000 persons per unit flow.

[17] Between 2,500 and 5,000 persons per unit flow.

[18] Less than 2,500 persons per unit flow.

Figure 15. Water deficit vs. water stress in ESCWA member countries



Source: Data compiled by ESCWA.

V. CONCLUSIONS AND RECOMMENDATIONS

The state of water resources in the ESCWA region is assessed with the perspective of applying IWRM concepts by member countries towards the sustainability of their water resources. The essence of IWRM application is the coordinated development and management of water and land resources. Hence, assessment is carried out in terms of water resources availability, land and water use, dependency and accessibility to improved water and sanitation facilities and water sustainability.

A total of 57 data points were identified for each country, namely, 28 basic data and 29 basic indicators. Adopting the DPSIR approach described in Methodology, the available indicators are grouped as follows:

(a) Seven indicators for water resources availability, namely, four indicating state and three indicating response;

(b) Eleven indicators for water and land resources use, namely, five indicating driving forces and six indicating pressure;

(c) Eight indicators for dependency and accessibility, namely, one indicating pressure, one indicating state and six indicating response;

(d) Three indicators for sustainability, namely, one indicating pressure and two indicating state.

The fact that no indicators are available on impact (I) of the present use of water resources on the society and/or ecosystem is alarming in the sense that the benefits of water use and its negative effects on the environment still remain obscure. In such a predominantly arid and semi-arid zone as the ESCWA region, a benefit to the society is often at the expense of the ecosystem as water resources are usually overexploited. Therefore, sustainable management of the available resources cannot properly be assessed without indicators for evaluating the impact of water use. Similarly, integrated management of the resources requires indicators on the quality of water, which are not presently available for any of the ESCWA member countries. Such indicators are important for monitoring groundwater quality, since the most accessible aquifers in the region are vulnerable to quality deterioration because of their shallow water table and/or proximity to seawater. Many of the urban centres in the region have developed on shallow aquifers and, hence, are polluting those aquifers by surface and/or subsurface effluent. Deeper aquifers that are usually of regional scale are also prone to salinization and quality deterioration due to mixing of various water bodies through fracture zones.

Considering the above, the main findings of this *Report* can be summarized as set forth in the following sections.

A. WATER RESOURECES AVAILABILITY

1. *Availability in terms of per capita share*

The per capita annual share from renewable water resources varies significantly, from 2,578 m^3 per person per year for Iraq to 71.7 m^3 per person per year for Kuwait. All ESCWA member countries, with the exception of Iraq and possibly the Syrian Arab Republic, fall below the "water poverty" line of 1,000 m^3 per person per year.

2. *Availability in terms of total volume*

The total renewable water resources presently available from conventional sources are estimated at 167.9 billion m^3 per year; of which 90.5 per cent, or about 148.4 billion m^3, is surface water, while the remaining 9.5 per cent, or 16.7 billion m^3, is groundwater. In addition, 19.7 billion m^3 per year of freshwater is produced from non-conventional sources. About half that water is produced in Egypt and the Syrian Arab Republic as agricultural drainage; namely, 7.5 billion m^3 per year and 2.2 billion m^3 per year, respectively.

The GCC countries are able to invest heavily in modern technology, mainly desalination, to produce enough freshwater from non-conventional sources for alleviating the prevailing water poverty. However, desalinated water produced in the GCC countries accounts for only about 14 per cent of the total non-conventional water in the region.

3. *Availability in terms of good quality water*

There are wide differences in the quality of surface water and groundwater systems in terms of total dissolved solids and/or electrical conductivity and temperature. However, the available data are too limited for conclusions to be drawn.

B. WATER AND LAND USE

The total per capita annual consumption in the three main sectors, namely, domestic, agricultural and industrial, ranges from 1,890 m^3 per person per year for Iraq to 83 m^3 per person per year for Palestine. Details on the sectoral consumption are set forth as follows:

1. *Domestic water use*

Total domestic water use in the ESCWA region is estimated at 15.1 billion m^3, and is expected to reach 24 billion m^3 in the year 2025. Iraq and Egypt account for 57 per cent of the total domestic water use; 31 per cent and 26 per cent, respectively. In terms of the per capita water use, the range is wide between countries, from 238.5 m^3 per person per year for the United Arab Emirates to 11.7 m^3 per person per year for Yemen.

2. *Agricultural water use*

Total agricultural water use in the region is presently estimated at about 141 billion m^3, with over 70 per cent being consumed in Egypt and Iraq alone. The per capita agricultural water use ranges widely, from 6.5 m^3 per person per year for Kuwait to about 1,630 m^3 per person per year for Iraq.

3. *Industrial water use*

A total of 11.9 billion m^3 is presently used by the industrial sectors across ESCWA member countries, with over 85 per cent of that water being consumed in Egypt and Iraq. In comparison with the domestic and agricultural sectors, the proportion of water used in the industrial sector is lower in all ESCWA member countries except Egypt, where 10.5 per cent of total water use is consumed by industry, as compared with 6.7 per cent for domestic use.

4. *Land use*

Cultivable land, namely, agricultural land suitable for cultivation, in the region is 92.33 x 10^6 ha and represents 18.7 per cent of the total area of 493.180 x 10^6 ha, or 4.93 million km^2. However, the land area that is actually cultivated is only 21.9 x 10^6 ha, or 4.4 per cent, of the total land. About 50 per cent of the cultivated land is irrigated, which means that irrigated land represents 2.2 per cent of the total available land in the region.

C. DEPENDENCY AND ACCESSIBILITY

1. *Dependency*

(a) *In terms of surface water and groundwater resources*

The ESCWA member countries can be grouped into three categories in terms of their dependency on surface water and groundwater. The categories are set forth as follows:

(i) Countries with perennial rivers and in which surface water constitutes the primary conventional source for freshwater as it represents over 70 per cent of the renewable water resources, namely: Egypt, Iraq, Jordan and Lebanon;

(ii) Countries in which groundwater constitutes at least one third of the total volume obtained from conventional sources, though surface water still remains the primary source, namely: Oman, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates and Yemen. They are characterized by perennial rivers or wadi systems with seasonal flash floods; the exception being the Syrian Arab Republic, which is traversed by the Tigris-Euphrates systems;

(iii) Countries in which the only conventional source of freshwater is groundwater, namely: Bahrain, Kuwait, Palestine and Qatar.

(b) *In terms of internal and external water resources*

Seven ESCWA member countries, namely, Bahrain, Egypt, Iraq, Jordan, Kuwait, Qatar and the Syrian Arab Republic, receive water from outside their political boundaries, with dependency ratios ranging from 100 per cent for Kuwait to 3.8 per cent for Qatar. Dependency on internationally shared water resources is particularly important for Egypt, Iraq and the Syrian Arab Republic, while the four GCC countries do not rely on external sources.

2. *Accessibility*

The entire urban populations in Egypt and the GCC countries, except Oman, have access to improved drinking water. In the remaining ESCWA member countries, accessibility of urban populations to improved drinking water ranges from 41 per cent for Oman to 98 per cent for Jordan and the Syrian Arab Republic. The situation is different for the rural populations, where the values range from 100 per cent for Bahrain, Qatar and the United Arab Emirates to 13 per cent for Iraq.

With respect to sanitation services, 100 per cent accessibility for urban populations is reported by Iraq, Kuwait, Palestine, Qatar and the United Arab Emirates. The level of services in the remaining countries ranges from 98 per cent for Oman to 38 per cent for Egypt. Provision of sanitation services in rural areas, as compared with urban, is generally lower in the non-GCC countries, while there is practically full coverage in the GCC countries.

D. SUSTAINABILITY

Sustainability of water resources in ESCWA member countries is assessed using three indicators to evaluate the "water poverty" level, namely, groundwater use intensity, water deficit and water stress. ESCWA member countries, with the exception of Iraq, Jordan and Oman, are seriously overdrafting their aquifer systems. There is a water deficit in seven countries, namely, Bahrain, Egypt, Kuwait, Qatar, Saudi Arabia, the United Arab Emirates and Yemen.

In terms of water stress, ESCWA member countries can be divided into the following four groups:

(a) Countries with critical water stress,[19] namely, Kuwait and the United Arab Emirates;

(b) Countries with serious water stress,[20] namely, Bahrain, Iraq, Palestine, Qatar and Yemen;

(c) Countries with significant water stress,[21] namely, Jordan and Saudi Arabia;

(d) Countries with slight water stress,[22] namely Egypt, Lebanon, Oman and the Syrian Arab Republic.

[19] See footnote 15.

[20] See footnote 16.

[21] See footnote 17.

[22] See footnote 18.

In the light of the above, the following suggestions can be made:

(a) The DPSIR approach should be adopted and applied by all ESCWA member countries to the analysis, updating and upgrading of available information such that a final set of data, including indicators and, possibly, indices, can be formulated and regularly updated;

(b) Harmonization and exchange of data are to be observed by member countries through collaboration and coordination with ESCWA through CWR;

(c) ESCWA may propose introducing specific items to the agenda of regular CWR sessions for discussion and official approval of water data which, upon publication, should be posted on the ESCWA website together with CWR documents, and be updated on a regular basis;

(d) Special attention is to be paid by both ESCWA and the member countries on how to incorporate land and water use management in the national IWRM plans currently under review, and formulating effective mechanisms for data acquisition and quality control to ensure their successful implementation;

(e) Low economic returns by the agricultural sector and ongoing depletion of aquifers through the "exporting of water in the form of cheap agricultural products" needs to be addressed, especially by such countries as Jordan and Yemen, which have serious water shortages;

(f) Close monitoring of aquifers which are experiencing rapid water table recession is needed, in addition to applying prompt remedial action;

(g) Reallocation of water across sectors needs to be assessed, particularly from agricultural use to domestic, since saving a small portion of irrigation water can solve many problems related to increasing urbanization.

Annex I

BASIC WATER-RELATED INFORMATION ON ESCWA MEMBER COUNTRIES

* Sources refer to listing in annex II; (EC) ESCWA calculations.

Abbreviations:

USD	United States dollars
USD/p	United States dollars per person
MCM	million cubic metres
mcm/y	million cubic metres per year
%	per cent
m^3/p/y	cubic metres per person per year
p/unit flow	person per unit flow (one unit flow is one million m^3 of renewable water)
.. [two dots]	data not available

BAHRAIN					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	728.0	a
2	Annual population growth rate	1995-2000	%	2.8	b
3	Annual population growth rate	2000-2005	%	1.6	b
4	Total GDP *(current prices)*	2005	10^6 USD	13,381.0	c
5	Per capita GDP	2005	USD/p	18,380.5	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2003	mcm/y	0.0	d
7	Mean annual groundwater recharge	2003	mcm/y	127.0	d
8	Total renewable water resources	2003	mcm/y	127.0	d
9	Mean annual production of desalinated water	2003	mcm/y	119.0	d
10	Mean annual production of treated wastewater for reuse	2003	mcm/y	15.0	d
11	Mean annual production of agricultural drainage for reuse	2003	mcm/y	0.2	d
12	Total water resources from non-conventional sources	2003	mcm/y	134.2	d
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2003	%	0.0	d (EC)
14	Groundwater as a percentage of total renewable water resources	2003	%	100.0	d (EC)
15	Per capita annual share from renewable water resources **(1)**	2003	m^3/p/y	181.9	a,d (EC)
16	Per capita annual share from non-conventional water resources **(1)**	2003	m^3/p/y	192.3	a,d (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2003	%	93.7	d (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2003	%	12.0	d (EC)
19	Non-conventional water resources produced as a percentage of renewable water resources	2003	%	105.7	d (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2001	mcm/y	231.9	d
21	Mean annual water use for domestic purposes	2001	mcm/y	139.1	d
22	Mean annual water use for agricultural purposes	2001	mcm/y	160.5	d
23	Mean annual water use for industrial purposes	2001	mcm/y	19.6	d
24	Total water use	2001	mcm/y	319.2	d
25	Total land	2005	10^3 ha	71.2	e
26	Total cultivable land	2005	10^3 ha	6.0	f
27	Total cultivated land	2005	10^3 ha	6.0	g
28	Total irrigated land	2005	10^3 ha	4.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	51.1	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2001	%	72.7	d (EC)
31	Domestic water use as a percentage of total water use	2001	%	43.6	d (EC)
32	Per capita domestic water use **(2)**	2001	m^3/p/y	208.5	a,d (EC)
33	Agricultural water use as a percentage of total water use	2001	%	50.3	a,d (EC)
34	Per capita agricultural water use **(2)**	2001	m^3/p/y	240.6	a,d (EC)
35	Industrial water use as a percentage of total water use	2001	%	6.1	a,d (EC)
36	Per capita industrial water use **(2)**	2001	m^3/p/y	29.4	a,d (EC)
37	Agricultural land as a percentage of total land	2005	%	8.4	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	8.4	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	66.7	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	0.4	c (EC)
41	Agricultural economic efficiency	2004	%	0.6	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2000	10^3	614.9	d,i (EC)
43	Rural population with access to improved drinking water	2000	10^3	35.1	d,i (EC)
44	Total population with access to improved drinking water	2000	10^3	650.0	d,i (EC)
45	Urban population with access to improved sanitation	2000	10^3	455.0	d,i (EC)
46	Rural population with access to improved sanitation	2000	10^3	NA	d,i (EC)
47	Total population with access to improved sanitation	2000	10^3	455.0	d,i (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2001	m^3/p/y	478.6	a,d (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2000	%	100.0	d
50	Rural population with access to improved drinking water as a percentage of rural population	2000	%	100.0	d
51	Total population with access to improved drinking water as a percentage of total population	2000	%	100.0	d,i (EC)
52	Urban population with access to improved sanitation as a percentage of total urban population	2000	%	74.0	d
53	Rural population with access to improved sanitation as a percentage of rural population	2000	%	NA	d
54	Total population with access to improved sanitation as a percentage of total population	2000	%	70.0	d,i (EC)
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2001	%	182.6	d (EC)
56	Water deficit	2001	m^3/p/y	-296.6	a,d (EC)
57	Water stress	2001	100 p/unit flow	55.0	a,d (EC)

(1) Population for year 2003 is 698,000.0
(2) Population for year 2001 is 667,000.0

EGYPT					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	73,256.0	a
2	Annual population growth rate	1995-2000	%	1.9	b
3	Annual population growth rate	2000-2005	%	1.9	b
4	Total GDP *(current prices)*	2005	10^6 USD	107,054.0	c
5	Per capita GDP	2005	USD/p	1,461.4	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water (1)	2000	mcm/y	55,500.0	n
7	Mean annual groundwater recharge	2000	mcm/y	1,384.0	j
8	Total renewable water resources	2000	mcm/y	56,884.0	j
9	Mean annual production of desalinated water (2)	2000	mcm/y	6.6	ag
10	Mean annual production of treated wastewater for reuse	2000	mcm/y	1,400.0	j
11	Mean annual production of agricultural drainage for reuse	2000	mcm/y	7,500.0	j
12	Total water resources from non-conventional sources	2000	mcm/y	8,906.6	j,af (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2000	%	97.6	j
14	Groundwater as a percentage of total renewable water resources	2000	%	2.4	j
15	Per capita annual share from renewable water resources	2000	m^3/p/y	851.0	a,j (EC)
16	Per capita annual share from non-conventional water resources	2000	m^3/p/y	133.2	a,j (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2000	%	0.01	j,ag (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2000	%	16.0	j
19	Non-conventional water resources produced as a percentage of renewable water resources	2000	%	15.7	j,ag (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2000	mcm/y	7,022.0	j
21	Mean annual water use for domestic purposes	1997	mcm/y	4,700.0	j
22	Mean annual water use for agricultural purposes	1997	mcm/y	57,800.0	j
23	Mean annual water use for industrial purposes	1997	mcm/y	7,500.0	j
24	Total water use	1997	mcm/y	70,000.0	j
25	Total land	2004	10^3 ha	100,144.9	e
26	Total cultivable land	2005	10^3 ha	3,520.0	f
27	Total cultivated land	2005	10^3 ha	3,520.0	g
28	Total irrigated land	2005	10^3 ha	3,422.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	14,170.9	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2000	%	10.0	j (EC)
31	Domestic water use as a percentage of total water use	1997	%	6.7	j (EC)
32	Per capita domestic water use (4)	1997	m^3/p/y	74.3	a,k (EC)
33	Agricultural water use as a percentage of total water use	1997	%	82.6	j (EC)
34	Per capita agricultural water use (4)	1997	m^3/p/y	914.3	a,k (EC)
35	Industrial water use as a percentage of total water use	1997	%	10.7	j (EC)
36	Per capita industrial water use (4)	1997	m^3/p/y	118.6	a,k (EC)
37	Agricultural land as a percentage of total land	2005	%	3.5	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	3.5	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	97.2	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	13.2	c (EC)
41	Agricultural economic efficiency	2004	%	0.5	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2003	10^3	31,179.8	i,,j (EC)
43	Rural population with access to improved drinking water	2003	10^3	17,918.2	i,,j (EC)
44	Total population with access to improved drinking water	2003	10^3	49,098.0	i,,j (EC)
45	Urban population with access to improved sanitation	2000	10^3	28,274.8	i,w (EC)
46	Rural population with access to improved sanitation	2000	10^3	36,724.0	i,w (EC)
47	Total population with access to improved sanitation	2000	10^3	64,998.8	i,w (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	1997	m^3/p/y	1,107.3	a,k (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2003	%	100.0	j
50	Rural population with access to improved drinking water as a percentage of rural population	2003	%	43.0	j
51	Total population with access to improved drinking water as a percentage of total population	2003	%	67.2	j
52	Urban population with access to improved sanitation as a percentage of total urban population	2000	%	100.0	w
53	Rural population with access to improved sanitation as a percentage of rural population	2000	%	96.0	w
54	Total population with access to improved sanitation as a percentage of total population	2000	%	97.7	i,w (EC)
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2000	%	507.4	j (EC)
56	Water deficit	2000	m^3/p/y	-256.3	a,j,k (EC)
57	Water stress	2000	100 p/unit flow	11.8	a,j (EC)

(1) Ministry of Water Resources and Irrigation in Egypt reported a value of 55,000.0 MCM for year 2000.
(2) The Ministry of Water Resources and Irrigation reported a value of 1,800.0 MCM for year 2000.
(3) Population for year 2000 is 66,842,000.0
(4) Population for year 1997 is 63,215,000.0
(5) The Ministry of Water Resources and Irrigation reported a value of 38.0% for year 2003.
(6) The Ministry of Water Resources and Irrigation reported a value of 40.0% for year 2003.
(7) The Ministry of Water Resources and Irrigation reported a value of 68.3% for year 2003.

IRAQ					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	28,084.0	a
2	Annual population growth rate	1995-2000	%	3.0	b
3	Annual population growth rate	2000-2005	%	2.8	b
4	Total GDP *(current prices)*	2005	10^6 USD	37,125.0	c
5	Per capita GDP	2005	USD/p	1,398.0	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water (1)	2001	mcm/y	72,651.6	l (EC)
7	Mean annual groundwater recharge (2)	2001	mcm/y	4,228.4	l (EC)
8	Total renewable water resources	2001	mcm/y	76,880.0	l
9	Mean annual production of desalinated water	2001	mcm/y	NA	l
10	Mean annual production of treated wastewater for reuse	2001	mcm/y	450.0	l
11	Mean annual production of agricultural drainage for reuse	2001	mcm/y	NA	l
12	Total water resources from non-conventional sources	2001	mcm/y	1,820.0	l
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources (3)	2001	%	94.5	l (EC)
14	Groundwater as a percentage of total renewable water resources	2001	%	5.5	l
15	Per capita annual share from renewable water resources	2001	m^3/p/y	2,578.0	l
16	Per capita annual share from non-conventional water resources (4)	2001	m^3/p/y	70.6	a,l (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2001	%	NA	l
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2001	%	NA	l
19	Non-conventional water resources produced as a percentage of renewable water resources	2001	%	NA	l
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2001	mcm/y	1,000.0	l
21	Mean annual water use for domestic purposes	2001	mcm/y	4,000.0	l
22	Mean annual water use for agricultural purposes	2001	mcm/y	42,000.0	l
23	Mean annual water use for industrial purposes	2001	mcm/y	2,720.0	l
24	Total water use	2001	mcm/y	48,720.0	l
25	Total land	2004	10^3 ha	43,831.7	e
26	Total cultivable land	2005	10^3 ha	9,623.0	f
27	Total cultivated land	2005	10^3 ha	6,019.0	g
28	Total irrigated land	2005	10^3 ha	3,525.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	3,181.2	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2001	mcm/y	2.1	l
31	Domestic water use as a percentage of total water use	2001	%	8.2	a,l (EC)
32	Per capita domestic water use (4)	2001	m^3/p/y	155.2	a,l (EC)
33	Agricultural water use as a percentage of total water use	2001	%	86.2	a,l (EC)
34	Per capita agricultural water use (4)	2001	m^3/p/y	1,629.7	a,l (EC)
35	Industrial water use as a percentage of total water use	2001	%	5.6	a,l (EC)
36	Per capita industrial water use (4)	2001	m^3/p/y	105.5	a,l (EC)
37	Agricultural land as a percentage of total land	2005	%	22.0	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	13.7	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	36.6	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	8.6	c (EC)
41	Agricultural economic efficiency	2004	%	1.1	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2001	10^3	11,380.2	i,l (EC)
43	Rural population with access to improved drinking water	2001	10^3	1,048.7	i,l (EC)
44	Total population with access to improved drinking water	2001	10^3	12,428.8	i,l (EC)
45	Urban population with access to improved sanitation	2001	10^3	16,985.3	i,l (EC)
46	Rural population with access to improved sanitation	2001	10^3	NA	
47	Total population with access to improved sanitation	2001	10^3	16,784.8	i,l (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2001	m^3/p/y	1,890.5	a,l (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2001	%	67.0	l
50	Rural population with access to improved drinking water as a percentage of rural population	2001	%	13.0	l
51	Total population with access to improved drinking water as a percentage of total population	2001	%	49.6	a,l (EC)
52	Urban population with access to improved sanitation as a percentage of total urban population	2001	%	100.0	l
53	Rural population with access to improved sanitation as a percentage of rural population	2001	%	NA	l
54	Total population with access to improved sanitation as a percentage of total population	2001	%	67.0	l
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2001	%	23.6	l (EC)
56	Water deficit	2001	m^3/p/y	687.5	a,l (EC)
57	Water stress	2001	100 p/unit flow	3.9	l (EC)

(1) The Ministry of Irrigation in Iraq reported a value of 76,880.0 MCM for year 2001. The reported indicator was calculated using indicator 7 and indicator 8.
(2) The Ministry of Irrigation in Iraq did not report any value for this indicator. The reported indicator was calculated using indicator 8 and indicator 14.
(3) The Ministry of Irrigation in Iraq reported a value of 100% for year 2001. The reported indicator was calculated using indicator 14.
(4) Population for year 2001 is 25,771,000.0

JORDAN					
	(a) General Socio Economic Data				
Serial no.	**Data**	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	5,566.0	a
2	Annual population growth rate	1995-2000	%	3.0	b
3	Annual population growth rate	2000-2005	%	2.7	b
4	Total GDP *(current prices)*	2005	10^6 USD	12,861.0	c
5	Per capita GDP	2005	USD/p	2,310.6	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2004	mcm/y	746.0	m
7	Mean annual groundwater recharge	2004	mcm/y	507.0	m
8	Total renewable water resources	2004	mcm/y	1,253.0	m
9	Mean annual production of desalinated water	2004	mcm/y	5.0	m
10	Mean annual production of treated wastewater for reuse	2004	mcm/y	74.0	m
11	Mean annual production of agricultural drainage for reuse	2004	mcm/y	NA	m
12	Total water resources from non-conventional sources	2004	mcm/y	79.0	m
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2004	%	60.0	m
14	Groundwater as a percentage of total renewable water resources	2004	%	40.0	m
15	Per capita annual share from renewable water resources	2004	m^3/p/y	234.0	m
16	Per capita annual share from non-conventional water resources	2004	m^3/p/y	14.8	m
17	Desalinated water produced as a percentage of total renewable water resources	2004	%	0.4	m
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2004	%	5.9	m
19	Non-conventional water resources produced as a percentage of renewable water resources	2004	%	6.3	m
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2004	mcm/y	501.0	m
21	Mean annual water use for domestic purposes	2004	mcm/y	281.0	m
22	Mean annual water use for agricultural purposes	2004	mcm/y	548.0	m
23	Mean annual water use for industrial purposes	2004	mcm/y	38.0	m
24	Total water use	2004	mcm/y	867.0	m
25	Total land	2004	10^3 ha	8,934.2	m
26	Total cultivable land	2004	10^3 ha	1,324.0	f
27	Total cultivated land **(1)**	2004	10^3 ha	270.0	g
28	Total irrigated land **(2)**	2004	10^3 ha	75.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	304.5	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2004	%	57.8	m
31	Domestic water use as a percentage of total water use	2004	%	32.4	m (EC)
32	Per capita domestic water use **(3)**	2004	m^3/p/y	52.1	a,m (EC)
33	Agricultural water use as a percentage of total water use	2004	%	63.2	m (EC)
34	Per capita agricultural water use **(3)**	2004	m^3/p/y	101.6	a,m (EC)
35	Industrial water use as a percentage of total water use	2004	%	4.4	m (EC)
36	Per capita industrial water use **(3)**	2004	m^3/p/y	7.0	a,m (EC)
37	Agricultural land as a percentage of total land	2004	%	14.8	f,m (EC)
38	Cultivated land as a percentage of total land	2004	%	3.0	m
39	Irrigated land as percentage of cultivable land	2004	%	5.7	f,m (EC)
40	Agricultural GDP as a percentage of total GDP	2004	%	2.0	m
41	Agricultural economic efficiency	2004	%	0.2	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2002	10^3	3,781.2	i,ae (EC)
43	Rural population with access to improved drinking water	2002	10^3	874.8	i,ae (EC)
44	Total population with access to improved drinking water	2002	10^3	4,656.0	i,ae (EC)
45	Urban population with access to improved sanitation	2002	10^3	2,739.5	i,ae (EC)
46	Rural population with access to improved sanitation	2002	10^3	37.6	i,ae (EC)
47	Total population with access to improved sanitation	2002	10^3	2,777.1	i,ae (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2004	m^3/p/y	160.8	a,m (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2002	%	98.0	ae
50	Rural population with access to improved drinking water as a percentage of rural population	2002	%	93.0	ae
51	Total population with access to improved drinking water as a percentage of total population	2002	%	97.0	ae
52	Urban population with access to improved sanitation as a percentage of total urban population	2002	%	71.0	ae
53	Rural population with access to improved sanitation as a percentage of rural population	2002	%	4.0	ae
54	Total population with access to improved sanitation as a percentage of total population	2002	%	56.0	ae
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2004	%	98.8	m (EC)
56	Water deficit	2004	m^3/p/y	73.2	m (EC)
57	Water stress	2004	100 p/unit flow	42.7	m (EC)

(1) The Ministry of Water and Irrigation in Jordan reported a value of 270.9 thousand ha for year 2004.
(2) The Ministry of Water and Irrigation in Jordan reported a value of 76.1 thousand ha for year 2004
(3) Population for year 2004 is 5,392,000.0

KUWAIT					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	2,705.0	a
2	Annual population growth rate	1995-2000	%	5.5	b
3	Annual population growth rate	2000-2005	%	3.7	b
4	Total GDP *(current prices)*	2005	10^6 USD	80,781.0	c
5	Per capita GDP *(USD per person)*	2005	USD/p	29,863.6	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2000	mcm/y	0.1	n
7	Mean annual groundwater recharge	2000	mcm/y	160.0	n
8	Total renewable water resources	2000	mcm/y	160.1	n (EC)
9	Mean annual production of desalinated water	2002	mcm/y	345.0	o
10	Mean annual production of treated wastewater for reuse	1997	mcm/y	52.0	p
11	Mean annual production of agricultural drainage for reuse		mcm/y	NA	
12	Total water resources from non-conventional sources	2002	mcm/y	397.0	o,p (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2000	%	0.1	n (EC)
14	Groundwater as a percentage of total renewable water resources	2002	%	99.9	n (EC)
15	Per capita annual share from renewable water resources **(1)**	2000	m^3/p/y	71.7	a,n (EC)
16	Per capita annual share from non-conventional water resources **(2)**	2002	m^3/p/y	162.5	a,o,p (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2000	%	215.5	n,o (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	1997	%	32.5	n,p (EC)
19	Non-conventional water resources produced as a percentage of renewable water resources	2002	%	248.0	n (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2000	mcm/y	405.0	n
21	Mean annual water use for domestic purposes	2003	mcm/y	405.5	q
22	Mean annual water use for agricultural purposes	2003	mcm/y	16.6	q
23	Mean annual water use for industrial purposes	2003	mcm/y	29.5	q
24	Total water use	2003	mcm/y	451.6	q
25	Total land	2004	10^3 ha	1,781.8	e
26	Total cultivable land	2005	10^3 ha	144.0	f
27	Total cultivated land	2005	10^3 ha	18.0	g
28	Total irrigated land	2005	10^3 ha	13.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	268.5	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2000	%	89.7	q,y (EC)
31	Domestic water use as a percentage of total water use	2003	%	89.8	q (EC)
32	Per capita domestic water use	2003	m^3/p/y	160.0	a,q (EC)
33	Agricultural water use as a percentage of total water use **(3)**	2003	%	3.7	q (EC)
34	Per capita agricultural water use	2003	m^3/p/y	6.5	a,q (EC)
35	Industrial water use as a percentage of total water use **(3)**	2003	%	6.5	q (EC)
36	Per capita industrial water use	2003	m^3/p/y	11.6	a,q (EC)
37	Agricultural land as a percentage of total land **(3)**	2005	%	8.1	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	1.0	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	9.0	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	0.3	c (EC)
41	Agricultural economic efficiency	2004	%	0.3	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2003	10^3	2,654.1	i,q (EC)
43	Rural population with access to improved drinking water	2003	10^3	NA	i,q (EC)
44	Total population with access to improved drinking water	2003	10^3	2,700.0	i,q (EC)
45	Urban population with access to improved sanitation	2003	10^3	2,654.1	i,q (EC)
46	Rural population with access to improved sanitation	2003	10^3	NA	i,q (EC)
47	Total population with access to improved sanitation	2003	10^3	2,700.0	i,q (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2003	m^3/p/y	178.2	a,q (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2003	%	100.0	q
50	Rural population with access to improved drinking water as a percentage of rural population	2003	%	NA	q
51	Total population with access to improved drinking water as a percentage of total population	2003	%	100.0	q
52	Urban population with access to improved sanitation as a percentage of total urban population	2003	%	100.0	q
53	Rural population with access to improved sanitation as a percentage of rural population	2003	%	NA	q
54	Total population with access to improved sanitation as a percentage of total population	2003	%	100.0	q
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2000	%	253.1	n (EC)
56	Water deficit	2000	m^3/p/y	-106.4	a,n,q (EC)
57	Water stress	2000	100 p/unit flow	139.4	a,n (EC)

(1) Population for year 2000 is 2,232,000.0
(2) Population for year 2002 is 2,443,000.0
(3) Population for year 2003 is 2,535,000.0

LEBANON					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	4,050.0	a
2	Annual population growth rate	1995-2000	%	1.3	b
3	Annual population growth rate	2000-2005	%	1.0	b
4	Total GDP *(current prices)*	2005	10^6 USD	20,898.0	c
5	Per capita GDP	2005	USD/p	5,160.0	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2004	mcm/y	2,200.0	r
7	Mean annual groundwater recharge	2004	mcm/y	150.0	r
8	Total renewable water resources	2004	mcm/y	2,350.0	r (EC)
9	Mean annual production of desalinated water	2000	mcm/y	2.0	n
10	Mean annual production of treated wastewater for reuse	1996	mcm/y	2.0	s
11	Mean annual production of agricultural drainage for reuse		mcm/y	NA	
12	Total water resources from non-conventional sources	2000	mcm/y	4.0	n,s (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2004	%	93.6	r (EC)
14	Groundwater as a percentage of total renewable water resources	2004	%	6.4	r (EC)
15	Per capita annual share from renewable water resources **(1)**	2003	m^3/p/y	594.5	a,r (EC)
16	Per capita annual share from non-conventional water resources **(2)**	2000	m^3/p/y	1.1	a,n,s (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2000	%	0.1	n,r (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	1996	%	0.1	r,s (EC)
19	Non-conventional water resources produced as a percentage of renewable water resources	2000	%	0.2	n,r,s (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2003	mcm/y	240.0	n
21	Mean annual water use for domestic purposes	2004	mcm/y	500.0	r
22	Mean annual water use for agricultural purposes	2004	mcm/y	900.0	r
23	Mean annual water use for industrial purposes	2004	mcm/y	150.0	r
24	Total water use	2004	mcm/y	1,550.0	r
25	Total land	2004	10^3 ha	1,040.0	e
26	Total cultivable land	2005	10^3 ha	399.0	f
27	Total cultivated land	2005	10^3 ha	313.0	g
28	Total irrigated land	2005	10^3 ha	104.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	1,112.9	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2003	%	15.5	n,r (EC)
31	Domestic water use as a percentage of total water use	2004	%	32.3	a,r (EC)
32	Per capita domestic water use **(3)**	2004	m^3/p/y	124.9	a,r (EC)
33	Agricultural water use as a percentage of total water use	2004	%	58.1	a,r (EC)
34	Per capita agricultural water use **(3)**	2004	m^3/p/y	227.7	a,r (EC)
35	Industrial water use as a percentage of total water use	2004	%	9.7	a,r (EC)
36	Per capita industrial water use **(3)**	2004	m^3/p/y	37.9	a,r (EC)
37	Agricultural land as a percentage of total land	2005	%	38.4	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	30.1	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	26.1	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	5.3	c (EC)
41	Agricultural economic efficiency	2004	%	2.7	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2004	10^3	2,258.1	i,r (EC)
43	Rural population with access to improved drinking water	2004	10^3	349.1	i,r (EC)
44	Total population with access to improved drinking water	2004	10^3	2,607.2	i,r (EC)
45	Urban population with access to improved sanitation	2004	10^3	1,737.0	i,r (EC)
46	Rural population with access to improved sanitation	2004	10^3	53.7	i,r (EC)
47	Total population with access to improved sanitation	2004	10^3	1,790.7	i,r (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2004	m^3/p/y	390.6	a,r (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2004	%	65.0	r
50	Rural population with access to improved drinking water as a percentage of rural population	2004	%	31.0	r
51	Total population with access to improved drinking water as a percentage of total population	2004	%	65.0	i,r (EC)
52	Urban population with access to improved sanitation as a percentage of total urban population	2004	%	50.0	r
53	Rural population with access to improved sanitation as a percentage of rural population	2004	%	10.0	r
54	Total population with access to improved sanitation as a percentage of total population	2004	%	44.6	3,i (EC)
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2003	%	160.0	n,r (EC)
56	Water deficit	2003	m^3/p/y	203.9	a,r (EC)
57	Water stress	2003	100 p/unit flow	16.8	a,r (EC)

(1) Population for year 2003 is 3,953,000.0
(2) Population for year 2000 is 3,805,000.0
(3) Population for year 2004 is 4,002,000.0

OMAN					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	2,515.0	a
2	Annual population growth rate	1995-2000	%	2.3	b
3	Annual population growth rate	2000-2005	%	1.0	b
4	Total GDP *(current prices)*	2005	10^6 USD	30,794.0	c
5	Per capita GDP	2005	USD/p	12,244.1	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2000	mcm/y	918.0	n
7	Mean annual groundwater recharge **(1)**	2000	mcm/y	550.0	n
8	Total renewable water resources	2000	mcm/y	1,468.0	n (EC)
9	Mean annual production of desalinated water	2002	mcm/y	86.0	u
10	Mean annual production of treated wastewater for reuse	1999	mcm/y	23.0	u
11	Mean annual production of agricultural drainage for reuse		mcm/y	NA	
12	Total water resources from non-conventional sources	2002	mcm/y	109.0	u (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2002	%	62.5	n (EC)
14	Groundwater as a percentage of total renewable water resources	2002	%	37.5	n (EC)
15	Per capita annual share from renewable water resources	2002	m^3/p/y	598.9	a,n (EC)
16	Per capita annual share from non-conventional water resources	2002	m^3/p/y	44.5	a,u (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2002	%	5.9	n,u (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2000	%	1.6	n,u (EC)
19	Non-conventional water resources produced as a percentage of renewable water resources	2002	%	7.4	n,u (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2003	mcm/y	1,150.0	u
21	Mean annual water use for domestic purposes	2003	mcm/y	205.0	u
22	Mean annual water use for agricultural purposes	2003	mcm/y	1,131.0	t
23	Mean annual water use for industrial purposes	2003	mcm/y	19.0	t
24	Total water use	2003	mcm/y	1,355.0	t,u (EC)
25	Total land	2004	10^3 ha	30,950.0	e
26	Total cultivable land	2005	10^3 ha	1,702.0	f
27	Total cultivated land	2005	10^3 ha	80.0	g
28	Total irrigated land	2005	10^3 ha	72.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	438.4	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2003	%	84.9	t,u (EC)
31	Domestic water use as a percentage of total water use	2003	%	15.1	t,u (EC)
32	Per capita domestic water use	2003	m^3/p/y	83.1	a,t (EC)
33	Agricultural water use as a percentage of total water use	2003	%	83.5	t,u (EC)
34	Per capita agricultural water use	2003	m^3/p/y	458.5	a,t (EC)
35	Industrial water use as a percentage of total water use	2003	%	1.4	t,u (EC)
36	Per capita industrial water use	2003	m^3/p/y	7.7	a,t (EC)
37	Agricultural land as a percentage of total land	2005	%	5.5	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	0.3	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	4.2	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	1.4	c (EC)
41	Agricultural economic efficiency	2004	%	0.1	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2003	10^3	949.8	i,af (EC)
43	Rural population with access to improved drinking water	2003	10^3	150.2	i,af (EC)
44	Total population with access to improved drinking water	2003	10^3	1,099.9	i,af (EC)
45	Urban population with access to improved sanitation	2003	10^3	1,756.2	i,af (EC)
46	Rural population with access to improved sanitation	2003	10^3	479.1	i,af (EC)
47	Total population with access to improved sanitation	2003	10^3	2,235.2	i,af (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2003	m^3/p/y	549.3	a,t (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2003	%	53.0	af
50	Rural population with access to improved drinking water as a percentage of rural population	2003	%	21.0	af
51	Total population with access to improved drinking water as a percentage of total population	2003	%	21.0	i,af (EC)
52	Urban population with access to improved sanitation as a percentage of total urban population	2003	%	98.0	af
53	Rural population with access to improved sanitation as a percentage of rural population	2003	%	67.0	af
54	Total population with access to improved sanitation as a percentage of total population	2003	%	89.2	i,af (EC)
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2003	%	209.1	n,u (EC)
56	Water deficit	2003	m^3/p/y	49.7	a,n,t (EC)
57	Water stress	2002	100 p/unit flow	16.7	a,n (EC)

(1) Source (ae) reported a value of 1,300.0 MCM for year 2002

PALESTINE					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	3,781.0	a
2	Annual population growth rate	1995-2000	%	3.8	b
3	Annual population growth rate	2000-2005	%	3.2	b
4	Total GDP *(current prices)*	2005	10^6 USD	4,116.0	c
5	Per capita GDP	2005	USD/p	1,088.6	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2002	mcm/y	0.0	v
7	Mean annual groundwater recharge	2002	mcm/y	679.0	v
8	Total renewable water resources	2002	mcm/y	679.0	v
9	Mean annual production of desalinated water	2002	mcm/y	0.0	v
10	Mean annual production of treated wastewater for reuse	2002	mcm/y	0.0	v
11	Mean annual production of agricultural drainage for reuse	2002	mcm/y	0.0	v
12	Total water resources from non-conventional sources	2002	mcm/y	0.0	v
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2001	%	0.0	v
14	Groundwater as a percentage of total renewable water resources	2001	%	100.0	v
15	Per capita annual share from renewable water resources **(1)**	2003	m^3/p/y	192.5	a,v (EC)
16	Per capita annual share from non-conventional water resources **(1)**	2003	m^3/p/y	0.0	a,v (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2003	%	0.0	v (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2003	%	0.0	v (EC)
19	Non-conventional water resources produced as a percentage of renewable water resources	2003	%	0.0	v (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction **(2)**	2001	mcm/y	1,204.0	v
21	Mean annual water use for domestic purposes	2002	mcm/y	125.0	v
22	Mean annual water use for agricultural purposes	2002	mcm/y	147.0	v
23	Mean annual water use for industrial purposes	2002	mcm/y	11.0	v
24	Total water use	2002	mcm/y	283.0	v (EC)
25	Total land	2004	10^3 ha	602.0	e
26	Total cultivable land	2005	10^3 ha	373.0	f
27	Total cultivated land	2005	10^3 ha	222.0	g
28	Total irrigated land	2005	10^3 ha	15.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	405.0	c
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2002	%	425.4	v (EC)
31	Domestic water use as a percentage of total water use	2002	%	44.2	v (EC)
32	Per capita domestic water use **(3)**	2002	m^3/p/y	36.7	a,v (EC)
33	Agricultural water use as a percentage of total water use	2002	%	51.9	v (EC)
34	Per capita agricultural water use **(3)**	2002	m^3/p/y	43.2	a,v (EC)
35	Industrial water use as a percentage of total water use	2002	%	3.9	v (EC)
36	Per capita industrial water use **(3)**	2002	m^3/p/y	3.2	a,v (EC)
37	Agricultural land as a percentage of total land	2005	%	62.0	e,f (EC)
38	Cultivated land as a percentage of total land	2005	%	36.9	e,g (EC)
39	Irrigated land as percentage of cultivable land	2005	%	4.0	f,g (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	9.8	c (EC)
41	Agricultural economic efficiency			NA	
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2000	10^3	2,139.4	i,v (EC)
43	Rural population with access to improved drinking water	2000	10^3	681.7	i,v (EC)
44	Total population with access to improved drinking water	2000	10^3	2,821.1	i,v (EC)
45	Urban population with access to improved sanitation	2000	10^3	2,252.0	i,v (EC)
46	Rural population with access to improved sanitation	2000	10^3	0.0	i,v (EC)
47	Total population with access to improved sanitation	2000	10^3	2,252.0	i,v (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2002	m^3/p/y	83.1	a,v (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2002	%	95.0	v
50	Rural population with access to improved drinking water as a percentage of rural population	2002	%	76.0	v
51	Total population with access to improved drinking water as a percentage of total population	2002	%	83.0	v
52	Urban population with access to improved sanitation as a percentage of total urban population	2002	%	100.0	v
53	Rural population with access to improved sanitation as a percentage of rural population	2002	%	0.0	v
54	Total population with access to improved sanitation as a percentage of total population	2002	%	30.0	v
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2002	%	177.3	v (EC)
56	Water deficit	2003	m^3/p/y	109.3	a,v (EC)
57	Water stress	2003	100 p/unit flow	52.0	a,v (EC)

(1) Population for year 2003 is 3,528,000.0
(2) The amount of water abstracted in Palestine is 1,204.0 MCM and only 251.0 MCM of which are used for Palestinians.
(3) Population for year 2002 is 3,404,000.0

QATAR					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	797.0	a
2	Annual population growth rate	1995-2000	%	2.9	b
3	Annual population growth rate	2000-2005	%	5.9	b
4	Total GDP *(current prices)*	2005	10^6 USD	42,463.0	c
5	Per capita GDP	2005	USD/p	53,278.5	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2000	mcm/y	1.4	n
7	Mean annual groundwater recharge	2000	mcm/y	85.0	n
8	Total renewable water resources **(1)**	2000	mcm/y	86.4	n (EC)
9	Mean annual production of desalinated water	2000	mcm/y	131.0	n
10	Mean annual production of treated wastewater for reuse	2000	mcm/y	NA	
11	Mean annual production of agricultural drainage for reuse	2000	mcm/y	NA	
12	Total water resources from non-conventional sources **(2)**	2000	mcm/y	159.0	n (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2000	%	1.6	n (EC)
14	Groundwater as a percentage of total renewable water resources **(3)**	2000	%	98.4	n (EC)
15	Per capita annual share from renewable water resources **(4,5)**	2000	m^3/p/y	139.8	a,n (EC)
16	Per capita annual share from non-conventional water resources **(5)**	2000	m^3/p/y	257.3	a,n (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2000	%	151.6	n (EC)
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2000	%	NA	
19	Non-conventional water resources produced as a percentage of renewable water resources	2000	%	184.0	n (EC)
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2000	mcm/y	185.0	n
21	Mean annual water use for domestic purposes	2002	mcm/y	83.0	x
22	Mean annual water use for agricultural purposes	2002	mcm/y	90.1	x (EC)
23	Mean annual water use for industrial purposes	2002	mcm/y	7.9	x
24	Total water use	2002	mcm/y	181.0	x
25	Total land	2004	10^3 ha	1,149.3	x
26	Total cultivable land **(6)**	2004	10^3 ha	61.0	f
27	Total cultivated land **(7)**	2004	10^3 ha	21.0	g
28	Total irrigated land **(8)**	2004	10^3 ha	13.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	59.3	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2002	%	NA	x
31	Domestic water use as a percentage of total water use	2002	%	45.9	x
32	Per capita domestic water use	2002	m^3/p/y	111.6	x
33	Agricultural water use as a percentage of total water use	2002	%	49.8	x (EC)
34	Per capita agricultural water use **(9)**	2002	m^3/p/y	131.0	a,x (EC)
35	Industrial water use as a percentage of total water use	2002	%	4.4	x
36	Per capita industrial water use	2002	m^3/p/y	10.6	x
37	Agricultural land as a percentage of total land	2004	%	5.7	x
38	Cultivated land as a percentage of total land	2004	%	0.6	x
39	Irrigated land as percentage of cultivable land	2004	%	21.3	x (EC)
40	Agricultural GDP as a percentage of total GDP	2005	%	0.2	x
41	Agricultural economic efficiency	2004	%	0.2	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2005	10^3	746.0	x
43	Rural population with access to improved drinking water	2005	10^3	40.0	x
44	Total population with access to improved drinking water	2005	10^3	786.0	x
45	Urban population with access to improved sanitation	2004	10^3	714.8	z
46	Rural population with access to improved sanitation	2004	10^3	62.2	z
47	Total population with access to improved sanitation	2004	10^3	777.0	z
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2002	m^3/p/y	253.2	a,x (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2005	%	100.0	x
50	Rural population with access to improved drinking water as a percentage of rural population	2005	%	100.0	x
51	Total population with access to improved drinking water as a percentage of total population	2005	%	100.0	x
52	Urban population with access to improved sanitation as a percentage of total urban population	2004	%	100.0	z
53	Rural population with access to improved sanitation as a percentage of rural population	2004	%	100.0	z
54	Total population with access to improved sanitation as a percentage of total population	2004	%	100.0	z
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2000	%	217.6	n (EC)
56	Water deficit	2002	m^3/p/y	-113.4	a,n,x (EC)
57	Water stress	2000	100 p/unit flow	71.5	a,n (EC)

(1) The Qatar General Electricity and Water Corporation reported a value of 1.5 MCM for year 2005

(2) The Qatar General Electricity and Water Corporation reported a value of 1.9 MCM for year 2005

(3) The Qatar General Electricity and Water Corporation reported a value of 100% for year 2005

(4) The Qatar General Electricity and Water Corporation reported a value of 2.0 m^3/p/y for year 2005.

(5) Population for year 2000 is 618,000.0

(6) The Qatar General Electricity and Water Corporation reported a value of 65.0 thousand ha for year 2004.

(7) The Qatar General Electricity and Water Corporation reported a value of 6.5 thousand ha for year 2004.

(8) The Qatar General Electricity and Water Corporation reported a value of 13.0 thousand ha for year 2004.

(9) Population for year 2002 is 688,000.0

SAUDI ARABIA

(a) General Socio Economic Data

Serial no.	Data	Year	Unit	Value	Source
1	Total population	2005	10^3	23,700.0	a
2	Annual population growth rate	1995-2000	%	2.8	b
3	Annual population growth rate	2000-2005	%	2.7	b
4	Total GDP *(current prices)*	2005	10^6 USD	309,531.0	c
5	Per capita GDP	2005	USD/p	13,060.4	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2004	mcm/y	5,000.0	aa
7	Mean annual groundwater recharge	2004	mcm/y	3,000.0	aa
8	Total renewable water resources	2004	mcm/y	8,000.0	aa
9	Mean annual production of desalinated water	2004	mcm/y	1,050.0	aa
10	Mean annual production of treated wastewater for reuse	2004	mcm/y	360.0	aa
11	Mean annual production of agricultural drainage for reuse	2004	mcm/y	40.0	aa
12	Total water resources from non-conventional sources	2004	mcm/y	1,450.0	aa
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2003	%	62.5	aa
14	Groundwater as a percentage of total renewable water resources	2003	%	37.5	aa
15	Per capita annual share from renewable water resources	2004	$m^3/p/y$	354.0	aa
16	Per capita annual share from non-conventional water resources **(1,2)**	2004	$m^3/p/y$	62.7	a,aa (EC)
17	Desalinated water produced as a percentage of total renewable water resources	2003	%	13.1	aa
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2003	%	8.0	aa
19	Non-conventional water resources produced as a percentage of renewable water resources	2003	%	18.1	aa
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2004	mcm/y	13,940.0	aa
21	Mean annual water use for domestic purposes	2004	mcm/y	2,100.0	aa
22	Mean annual water use for agricultural purposes	2004	mcm/y	17,530.0	aa
23	Mean annual water use for industrial purposes	2004	mcm/y	640.0	aa
24	Total water use	2004	mcm/y	20,270.0	aa
25	Total land	2000	10^3 ha	225,000.0	aa
26	Total cultivable land **(3)**	2003	10^3 ha	64,488.0	f
27	Total cultivated land **(4)**	2003	10^3 ha	3,798.0	g
28	Total irrigated land **(5)**	2003	10^3 ha	1,620.0	g
29	Agricultural GDP (current prices)	2005	10^6 USD	10,204.2	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2004	%	68.7	aa
31	Domestic water use as a percentage of total water use	2004	%	10.4	aa (EC)
32	Per capita domestic water use **(2)**	2004	$m^3/p/y$	90.8	a,aa (EC)
33	Agricultural water use as a percentage of total water use	2004	%	86.5	aa (EC)
34	Per capita agricultural water use **(2)**	2004	$m^3/p/y$	757.9	a,aa (EC)
35	Industrial water use as a percentage of total water use	2004	%	3.2	aa (EC)
36	Per capita industrial water use **(2)**	2004	$m^3/p/y$	27.7	a,aa (EC)
37	Agricultural land as a percentage of total land	2003	%	23.4	aa
38	Cultivated land as a percentage of total land	2003	%	1.9	aa
39	Irrigated land as percentage of cultivable land	2003	%	2.3	aa
40	Agricultural GDP as a percentage of total GDP	2004	%	4.0	aa
41	Agricultural economic efficiency	2004	%	0.5	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2004	10^3	20,406.0	aa
43	Rural population with access to improved drinking water	2004	10^3	2,267.0	aa
44	Total population with access to improved drinking water	2004	10^3	22,673.0	aa
45	Urban population with access to improved sanitation	2004	10^3	20,406.0	aa
46	Rural population with access to improved sanitation	2004	10^3	1,587.0	aa
47	Total population with access to improved sanitation	2004	10^3	21,993.0	aa
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2004	$m^3/p/y$	876.4	aa (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2004	%	100.0	aa
50	Rural population with access to improved drinking water as a percentage of rural population	2004	%	64.0	aa
51	Total population with access to improved drinking water as a percentage of total population	2004	%	95.0	aa
52	Urban population with access to improved sanitation as a percentage of total urban population	2004	%	90.0	aa
53	Rural population with access to improved sanitation as a percentage of rural population	2004	%	40.0	aa
54	Total population with access to improved sanitation as a percentage of total population	2004	%	89.0	aa
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2003	%	464.7	aa (EC)
56	Water deficit	2003	$m^3/p/y$	-522.4	aa (EC)
57	Water stress	2003	100 p/unit flow	28.2	aa (EC)

(1) The Ministry of Water and Electricity in Saudi Arabia reported a value of 482.5 $m^3/p/y$ for year 2004.
(2) Population for year 2004 is 23,130,000.0
(3) The Ministry of Water and Electricity in Saudi Arabia reported a value of 52,684.0 thousand ha for year 2003.
(4) The Ministry of Water and Electricity in Saudi Arabia reported a value of 4,357.0 thousand ha for year 2003.
(5) The Ministry of Water and Electricity in Saudi Arabia reported a value of 1,173.0 thousand ha for year 2003.

SYRIAN ARAB REPUBLIC					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	18,973.0	a
2	Annual population growth rate	1995-2000	%	2.6	b
3	Annual population growth rate	2000-2005	%	2.5	b
4	Total GDP *(current prices)*	2005	10^6 USD	29,534.0	c
5	Per capita GDP	2005	USD/p	1,556.6	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2004	mcm/y	9,880.0	ab
7	Mean annual groundwater recharge	2004	mcm/y	4,898.0	ab
8	Total renewable water resources	2004	mcm/y	14,779.0	ab
9	Mean annual production of desalinated water	2004	mcm/y	0.0	ab
10	Mean annual production of treated wastewater for reuse	2004	mcm/y	1,280.0	ab
11	Mean annual production of agricultural drainage for reuse	2004	mcm/y	2,246.0	ab
12	Total water resources from non-conventional sources	2004	mcm/y	3,526.0	ab
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2004	%	66.9	ab
14	Groundwater as a percentage of total renewable water resources	2004	%	33.1	ab
15	Per capita annual share from renewable water resources	2004	m^3/p/y	1,056.7	ab
16	Per capita annual share from non-conventional water resources	2004	m^3/p/y	190.7	ab
17	Desalinated water produced as a percentage of total renewable water resources	2004	%	0.0	ab
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2004	%	23.9	ab
19	Non-conventional water resources produced as a percentage of renewable water resources	2004	%	23.9	ab
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2005	mcm/y	8,339.0	ab
21	Mean annual water use for domestic purposes	2004	mcm/y	1,453.0	ab
22	Mean annual water use for agricultural purposes	2004	mcm/y	15,608.0	ab
23	Mean annual water use for industrial purposes	2004	mcm/y	608.0	ab
24	Total water use	2004	mcm/y	17,669.0	ab
25	Total land	2005	10^3 ha	18,518.0	ab
26	Total cultivable land (1)	2005	10^3 ha	6,436.0	f
27	Total cultivated land (2)	2005	10^3 ha	5,742.0	g
28	Total irrigated land (3)	2005	10^3 ha	1,333.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	6,533.3	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2005	%	47.2	ab
31	Domestic water use as a percentage of total water use	2004	%	8.2	ab (EC)
32	Per capita domestic water use (4)	2004	m^3/p/y	78.7	a,ab (EC)
33	Agricultural water use as a percentage of total water use	2004	%	88.3	ab (EC)
34	Per capita agricultural water use (4)	2004	m^3/p/y	845.3	a,ab (EC)
35	Industrial water use as a percentage of total water use	2004	%	3.4	ab (EC)
36	Per capita industrial water use (4)	2004	m^3/p/y	32.9	a,ab (EC)
37	Agricultural land as a percentage of total land	2005	%	34.2	ab
38	Cultivated land as a percentage of total land	2005	%	29.3	ab
39	Irrigated land as percentage of cultivable land	2005	%	22.8	ab
40	Agricultural GDP as a percentage of total GDP	2004	%	29.4	ab
41	Agricultural economic efficiency	2004	%	0.9	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2005	10^3	8,748.2	ab
43	Rural population with access to improved drinking water	2005	10^3	7,569.8	ab
44	Total population with access to improved drinking water	2005	10^3	16,318.0	ab
45	Urban population with access to improved sanitation	2005	10^3	7,670.0	ab
46	Rural population with access to improved sanitation	2005	10^3	4,986.0	ab
47	Total population with access to improved sanitation	2005	10^3	12,656.0	ab
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2004	m^3/p/y	956.9	ab (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2005	%	98.0	ab
50	Rural population with access to improved drinking water as a percentage of rural population	2005	%	85.0	ab
51	Total population with access to improved drinking water as a percentage of total population	2005	%	90.0	ab
52	Urban population with access to improved sanitation as a percentage of total urban population	2005	%	87.0	ab
53	Rural population with access to improved sanitation as a percentage of rural population	2005	%	65.0	ab
54	Total population with access to improved sanitation as a percentage of total population	2005	%	70.0	ab
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2005	%	170.3	ab (EC)
56	Water deficit	2005	m^3/p/y	99.8	ab (EC)
57	Water stress	2005	100 p/unit flow	9.5	ab (EC)

(1) The Ministry of Irrigation in Syria reported a value of 6,338.0 thousand ha for year 2005.
(2) The Ministry of Irrigation in Syria reported a value of 5,421.0 thousand ha for year 2005.
(3) The Ministry of Irrigation in Syria reported a value of 1,370.3 thousand ha for year 2005.
(4) Population for year 2004 is 18,464,000.0

UNITED ARAB EMIRATES

(a) General Socio Economic Data

Serial no.	Data	Year	Unit	Value	Source
1	Total population	2005	10^3	4,112.0	a
2	Annual population growth rate	1995-2000	%	5.8	b
3	Annual population growth	2000-2005	%	6.5	b
4	Total GDP *(current prices)*	2005	10^6 USD	133,564.0	c
5	Per capita GDP	2005	USD/p	43,001.9	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2002	mcm/y	190.0	ac
7	Mean annual groundwater recharge	2002	mcm/y	129.0	ac
8	Total renewable water resources	2002	mcm/y	319.0	ac
9	Mean annual production of desalinated water	2004	mcm/y	1,008.0	ac
10	Mean annual production of treated wastewater for reuse	2004	mcm/y	234.5	ac
11	Mean annual production of agricultural drainage for reuse	2004	mcm/y	0.0	ac
12	Total water resources from non-conventional sources	2004	mcm/y	1,242.5	ac
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2002	%	59.6	ac
14	Groundwater as a percentage of total renewable water resources	2002	%	40.4	ac
15	Per capita annual share from renewable water resources	2004	m^3/p/y	78.7	ac
16	Per capita annual share from non-conventional water resources	2004	m^3/p/y	306.5	ac
17	Desalinated water produced as a percentage of total renewable water resources	2004	%	316.0	ac
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2003	%	73.5	ac
19	Non-conventional water resources produced as a percentage of renewable water resources	2004	%	389.5	ac
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2002	mcm/y	2,226.0	ac
21	Mean annual water use for domestic purposes	2004	mcm/y	943.0	ac
22	Mean annual water use for agricultural purposes	2003	mcm/y	1,914.0	ac
23	Mean annual water use for industrial purposes	2004	mcm/y	60.0	ac
24	Total water use	2004	mcm/y	2,917.0	ac
25	Total land	2001	10^3 ha	8,360.0	ac
26	Total cultivable land (1)	2005	10^3 ha	559.0	f
27	Total cultivated land (2)	2005	10^3 ha	254.0	g
28	Total irrigated land (3)	2005	10^3 ha	76.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	3,002.5	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2004	%	76.3	ac
31	Domestic water use as a percentage of total water use	2004	%	32.3	ac (EC)
32	Per capita domestic water use (4)	2004	m^3/p/y	238.5	a,ac (EC)
33	Agricultural water use as a percentage of total water use	2004	%	65.6	ac (EC)
34	Per capita agricultural water use (4)	2004	m^3/p/y	484.1	a,ac (EC)
35	Industrial water use as a percentage of total water use	2004	%	2.1	ac (EC)
36	Per capita industrial water use (4)	2002	m^3/p/y	15.2	a,ac (EC)
37	Agricultural land as a percentage of total land	2002	%	3.4	ac
38	Cultivated land as a percentage of total land	2001	%	3.2	ac
39	Irrigated land as percentage of cultivable land	2002	%	27.0	ac
40	Agricultural GDP as a percentage of total GDP	2002	%	3.3	ac
41	Agricultural economic efficiency	2004	%	0.6	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2004	10^3	3,446.0	ac
43	Rural population with access to improved drinking water	2004	10^3	608.0	ac
44	Total population with access to improved drinking water	2004	10^3	4,054.0	ac
45	Urban population with access to improved sanitation	2004	10^3	3,446.0	ac
46	Rural population with access to improved sanitation	2004	10^3	608.0	ac
47	Total population with access to improved sanitation	2004	10^3	4,054.0	ac
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2004	m^3/p/y	737.7	ac (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2004	%	100.0	ac
50	Rural population with access to improved drinking water as a percentage of rural population	2004	%	100.0	ac
51	Total population with access to improved drinking water as a percentage of total population	2004	%	100.0	ac
52	Urban population with access to improved sanitation as a percentage of total urban population	2004	%	100.0	ac
53	Rural population with access to improved sanitation as a percentage of rural population	2004	%	100.0	ac
54	Total population with access to improved sanitation as a percentage of total population	2004	%	100.0	ac
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2004	%	1,725.6	ac (EC)
56	Water deficit	2004	m^3/p/y	-659.0	ac (EC)
57	Water stress	2004	100 p/unit flow	127.1	ac (EC)

(1) The Ministry of Electricity and Water in United Arab Emirates reported a value of 281.0 thousand ha for year 2002.
(2) The Ministry of Electricity and Water in United Arab Emirates reported a value of 266.0 thousand ha for year 2002.
(3) The Ministry of Electricity and Water in United Arab Emirates reported a value of 76.0 thousand ha for year 2002.
(4) Population for year 2004 is 3,954,000.0

YEMEN					
	(a) General Socio Economic Data				
Serial no.	***Data***	***Year***	***Unit***	***Value***	***Source***
1	Total population	2005	10^3	21,156.0	a
2	Annual population growth rate	1995-2000	%	3.3	b
3	Annual population growth rate	2000-2005	%	3.1	b
4	Total GDP *(current prices)*	2005	10^6 USD	8,154.0	c
5	Per capita GDP	2005	USD/p	385.4	a,c (EC)
	(b) Water resources availability				
	Data	***Year***	***Unit***	***Value***	***Source***
6	Total surface water	2001	mcm/y	1,500.0	ad
7	Mean annual groundwater recharge	2001	mcm/y	1,000.0	ad
8	Total renewable water resources	2001	mcm/y	2,500.0	ad
9	Mean annual production of desalinated water	2001	mcm/y	7.3	ad
10	Mean annual production of treated wastewater for reuse	2001	mcm/y	89.0	ad
11	Mean annual production of agricultural drainage for reuse	2001	mcm/y	0.0	ad
12	Total water resources from non-conventional sources	2002	mcm/y	96.3	ad
	Indicators	***Year***	***Unit***	***Value***	***Source***
13	Available surface water as a percentage of total renewable water resources	2001	%	60.0	ad
14	Groundwater as a percentage of total renewable water resources	2001	%	40.0	ad
15	Per capita annual share from renewable water resources	2001	m^3/p/y	145.7	ad
16	Per capita annual share from non-conventional water resources	2001	m^3/p/y	5.6	ad
17	Desalinated water produced as a percentage of total renewable water resources	2001	%	0.3	ad
18	Treated wastewater and agricultural drainage produced as a percentage of total renewable water	2001	%	3.6	ad
19	Non-conventional water resources produced as a percentage of renewable water resources	2002	%	3.9	ad
	(c) Land and water resources use				
	Data	***Year***	***Unit***	***Value***	***Source***
20	Total groundwater abstraction	2001	mcm/y	2,400.0	ad
21	Mean annual water use for domestic purposes	2002	mcm/y	200.0	ad
22	Mean annual water use for agricultural purposes	2002	mcm/y	3,150.0	ad
23	Mean annual water use for industrial purposes	2002	mcm/y	50.0	ad
24	Total water use	2002	mcm/y	3,400.0	ad
25	Total land	2002	10^3 ha	52,797.0	e
26	Total cultivable land **(1)**	2005	10^3 ha	3,693.0	f
27	Total cultivated land **(2)**	2005	10^3 ha	1,669.0	g
28	Total irrigated land **(3)**	2005	10^3 ha	550.0	g
29	Agricultural GDP *(current prices)*	2005	10^6 USD	2,112.6	c (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
30	Groundwater abstracted as a percentage of total water resources used	2001	%	70.6	ad
31	Domestic water use as a percentage of total water use	2002	%	5.9	ad
32	Per capita domestic water use	2002	m^3/p/y	11.7	ad
33	Agricultural water use as a percentage of total water use	2002	%	92.6	ad
34	Per capita agricultural water use	2002	m^3/p/y	183.5	ad
35	Industrial water use as a percentage of total water use	2002	%	1.5	ad
36	Per capita industrial water use	2002	m^3/p/y	2.9	ad
37	Agricultural land as a percentage of total land	2002	%	7.0	ad,e (EC)
38	Cultivated land as a percentage of total land	2002	%	3.2	ad,e (EC)
39	Irrigated land as percentage of cultivable land	2002	%	14.9	ad
40	Agricultural GDP as a percentage of total GDP	2005	%	25.9	c (EC)
41	Agricultural economic efficiency	2004	%	0.3	h
	(d) Dependency and Accessibility				
	Data	***Year***	***Unit***	***Value***	***Source***
42	Urban population with access to improved drinking water	2004	10^3	4,088.9	i,ad (EC)
43	Rural population with access to improved drinking water	2004	10^3	9,969.1	i,ad (EC)
44	Total population with access to improved drinking water	2004	10^3	14,057.9	i,ad (EC)
45	Urban population with access to improved sanitation	2004	10^3	4,952.7	i,ad (EC)
46	Rural population with access to improved sanitation	2004	10^3	4,294.4	i,ad (EC)
47	Total population with access to improved sanitation	2004	10^3	9,247.1	i,ad (EC)
	Indicators	***Year***	***Unit***	***Value***	***Source***
48	Per capita use of fresh water resources	2002	m^3/p/y	198.1	ad (EC)
49	Urban population with access to improved drinking water as a percentage of total urban population	2004	%	71.0	ad
50	Rural population with access to improved drinking water as a percentage of rural population	2004	%	65.0	ad
51	Total population with access to improved drinking water as a percentage of total population	2004	%	67.0	ad
52	Urban population with access to improved sanitation as a percentage of total urban population	2004	%	86.0	ad
53	Rural population with access to improved sanitation as a percentage of rural population	2004	%	28.0	ad
54	Total population with access to improved sanitation as a percentage of total population	2004	%	43.8	i,ad (EC)
	(e) Sustainability				
	Indicators	***Year***	***Unit***	***Value***	***Source***
55	Groundwater use intensity	2001	%	240.0	ad (EC)
56	Water deficit	2001	m^3/p/y	-52.4	ad (EC)
57	Water stress	2001	100 p/unit flow	68.6	ad (EC)

(1) The National Water Resources Authority of the Ministry of Water and Environment in Yemen reported a value of 1,452.0 thousand ha for year 2002.
(2) The National Water Resources Authority of the Ministry of Water and Environment in Yemen reported a value of 1,189.0 thousand ha for year 2002.
(3) The National Water Resources Authority of the Ministry of Water and Environment in Yemen reported a value of 408.0 thousand ha for year 2002.

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Annex III

METHODOLOGY AND TECHNICAL NOTES

A. METHODOLOGY

1. *The information triangle*

Primary scientific data comprise the broad base of the so-called "information triangle", as can be seen from figure A1. Indicators[23] and indices[24] can be developed through analysis and aggregation of primary data. Figure A1 suggests, however, that the quantity of information shrinks with increasing aggregation. It is also to be noted that indicators tend to be technical in comparison with data, while indices are descriptive. Furthermore, the information requirements of various users of indicators vary significantly in terms of detail, aggregation and quantity. For instance, scientists collect and use the largest amount of data to derive information with the most details, while decision makers and media require aggregated and synopsis information.

Indicators are used to provide information about the functioning of a specific system, for a specific purpose, to support decision-making and management. An indicator quantifies and aggregates data that can be measured and monitored to determine whether change is taking place. Scientific knowledge and judgment are the dominant criteria specifying an indicator. An index, on the other hand, is a set of aggregated or weighted parameters or indicators that describes a situation. An index aims to provide compact and targeted information for management and policy development. The emphasis is not on scientific justification, but on responding to the societal needs.

Indicators have two main advantages, namely:

(a) To quantify information so that its significance becomes more apparent;
(b) To simplify information about complex phenomena to improve communication.

As such, the major functions of indicators are the following:

(a) To determine the status of a certain system;
(b) To assess conditions and trends over time;
(c) To compare places and situations;
(d) To assess conditions and trends in relation to goals and targets;
(e) To predict and provide early warning of emerging problems;
(f) To measure the effectiveness of management policies.

2. *The IWRM approach*

The challenge that faces countries with water shortages is enormous and extremely complicated as it involves a diversity of stakeholders. Not only technical, but also socio-economic, legal and institutional aspects are to be tackled if sustainable development of the available water resources is to be attained. The application of IWRM[25] concepts to the prevailing issues has been advocated by the international community,

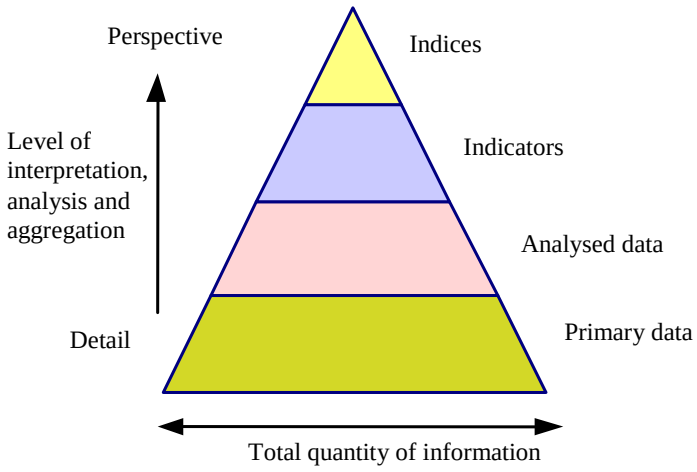
[23] According to WWDR1: a single data (a variable) or an output value from a set of data (aggregation of variables) that describes a system or process such that it has significance beyond the face value of its components.

[24] According to WWDR1: a mathematical aggregation of variables or indicators, often across different measurement units so that the result is dimensionless.

[25] The Global Water Partnership (GWP) Technical Committee describes IWRM as "a process that promotes the co-coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

and ESCWA member countries have either prepared, or are in the process of preparing national IWRM strategies. IWRM is nowadays regarded as the vehicle that makes the "integral view" of sustainable development operational for the management of freshwater resources, in the sense that the interests of people, society, economy and environment are to be seen as an interconnected whole and trade-offs respecting all interests need to be made. The holistic approach adopted in IWRM implies that information is needed on the state of the economy, society and water resources, and their mutual relationships. It also means that there must be tools for effective communication between different groups of stakeholders as it invokes the need for greater participation in the process of sustainable development.

Figure A1. The Information Triangle



The state of water resources in the ESCWA region is therefore to be assessed and analysed within the scope of IWRM and the development of indicators for that purpose is directed towards the identification and selection of indicators for the different aspects and issues related to IWRM. It is also essential that indicators are developed on absolutely clear criteria. Six criteria are recommended in WWDR1[26] for the development of indicators. They are set forth as follows:

(a) Relevance: the numerical value of an indicator should represent the degree of "what should be measured" directly;

(b) Clarity: namely, ambiguity and arbitrariness should be excluded from measuring with an indicator;

(c) Cost: the cost of the evaluation by an indicator should be affordably low;

(d) Continuity: availability of coherent data, both in historical and regional scope, should be respected;

(e) Comprehensibility: definition/expression of an indicator should be intuitively/easily comprehensible to users;

(f) Social benefit: net social benefit that an indicator yields, as it is applied, should be maximized.

[26] UNESCO, *The First United Nations World Water Development Report: Water for People, Water for Life* (22 March 2003), available at: http://www.unesco.org/water/wwap/wwdr1/table_contents/index.shtml.

Indicators on IWRM are comprised of measurements and derived values that track the changes of water resources conditions and their management efforts and success or failure over time. They help measure the state of water resources in general, the pressures exerted on them, and the resulting impacts on ecological and human health. More importantly, such indicators show progress of measures and policies aiming at the protection and sustainable development of water resources. Indicators used for enhancing the application of IWRM concepts at national and/or regional levels must provide information on the following:

(a) Availability of water resources;
(b) Demand on those resources;
(c) Accessibility of the population to the resources;
(d) Sustainability of the resources for future generations.

As suggested in WWDR-1, water indicators must at the same time provide decision makers with a means to understand the importance of water issues so as to involve them in promoting effective water governance; and provide experts on water issues with a way to step "outside the water box", in order for them to take into account broader social, political and economic issues into the water equation. That, in turn, would require transparent and mutually communicable strategies for decision makers and water specialists that both have a clear understanding of the state of progress in terms of a global desire to achieve water-related goals and targets through effective implementation of policies and related actions.

3. *The proposed framework*

Two main issues stand out as the primary drivers for indicator development, namely:

(a) The need to present complex phenomena in meaningful, understandable, comparable and objective numbers to decision makers and the public;

(b) The need to establish objective benchmarks and analyse changes over time and space.

A suitable framework is needed for organizing the process of selecting and developing indicators in order to:

(a) Link data to decision making;
(b) Structure the collection, analysis and presentation of information;
(c) Identify data gaps and duplications;
(d) Assist in developing new data to fill data gaps;
(e) Provide consistent data within a country.

B. TECHNICAL NOTES

(# 1) Total population

Data on the population size were obtained from United Nations Department of Economic and Social Affairs Population Division *World Population Prospects: The 2006 Revision*, available at: http://www.un.org/esa/population/publications/wpp2006/wpp2006.htm.

(# 2, 3) Annual population growth (%)

Data on annual population growth for the specific period were obtained from United Nations Department of Economic and Social Affairs Population Division *World Population Prospects: The 2004 Revision*, available at: http://www.un.org/esa/population/publications/WPP2004/wpp2004.htm.

(# 4) Total GDP at current prices (USD)

Data on GDP were obtained from National Accounts Studies of the ESCWA Region; Bulletin No. 25, United Nations, New York, 2005 (E/ESCWA/SCU/2005/6).

(# 5) Per capita GDP (USD per person)

The indicator was calculated by dividing total GDP at current prices by total population, both for the year 2005.

(# 6, 7) Total surface water, mean annual groundwater recharge (million m^3/y)

Data were collected through a questionnaire sent by ESCWA to ministries and other authorities responsible of water resources management in their respective countries. If ministries were unable to provide data, other sources were used, with priority given to national sources and United Nations publications.

(# 8) Total renewable water resources (million m^3/y)

The value equals the sum of "total surface water" and "mean annual groundwater recharge".

(# 9, 10, 11) Mean annual production of desalinated water, mean annual production of treated wastewater for reuse, mean annual production of agricultural drainage for reuse (million m^3/y)

Data were collected through a questionnaire sent by ESCWA to ministries and authorities responsible of water resources management in their respective countries. If ministries were unable to provide data, other sources were used, with priority given to national sources and United Nations publications.

(# 12) Total water resources from non-conventional sources (million m^3/y)

This value equals the sum of "mean annual production of desalinated water", "mean annual production of treated wastewater for reuse" and "mean annual production of agricultural drainage for reuse".

(# 13) Available surface water as a percentage of total renewable water resources (%)

This indicator is calculated by dividing "total surface water" by "total renewable water resources".

(# 14) Groundwater as a percentage of total renewable water resources (%)

This indicator is calculated by dividing "mean annual groundwater recharge" by "total renewable water resources".

(# 15) Per capita annual share from renewable water resources ($m^3/p/y$)

This indicator is calculated by dividing "total renewable water resources" by the population size for a specific year.

(# 16) Per capita annual share from non-renewable water resources ($m^3/p/y$)

This indicator is calculated by dividing "total water resources from non-conventional sources" by the population size for a specific year.

(# 17) Desalinated water produced as a percentage of total renewable water resources (%)

This indicator is calculated by dividing "mean annual production of desalinated water" by "total renewable water resources".

(# 18) Treated wastewater and agricultural drainage produced as a percentage of total renewable water resources (%)

This indicator is calculated by dividing "treated wastewater and agricultural drainage produced" by "total renewable water resources".

(# 19) Non-conventional water resources produced as a percentage of renewable water resources (%)

This indicator is calculated by dividing "total water resources from non-conventional sources" by "total renewable water resources".

(# 20) Total groundwater abstraction (million m^3/y)

Data were collected through a questionnaire sent by ESCWA to ministries and authorities responsible of water resources management in their respective countries. If ministries were unable to provide data, other sources were used, with priority given to national sources and United Nations publications.

(# 21, 22, 23) Mean annual water use for domestic purposes/agricultural purposes/industrial purposes (million m^3/y)

Data were collected through a questionnaire sent by ESCWA to ministries responsible of water resources management in their respective countries. If ministries were unable to provide data, other sources were used, with priority given to national sources and United Nations publications.

(# 24) Total water use (million m^3/y)

This value equals the sum of "mean annual water use for domestic purposes", "mean annual water use for agricultural purposes" and "mean annual water use for industrial purposes".

(# 25) Total land (hectares)

Data were collected through a questionnaire sent by ESCWA to ministries and authorities responsible for water resources management in their respective countries. If ministries and authorities were unable to provide data, the twenty-sixth issue of Statistical Abstract of the ESCWA Region was used. (See: http://www.escwa.un.org/divisions.scu/statabs26/index.asp).

(# 26) Total cultivable land (hectares)

Also referred to as "agricultural area", this indicator is equal to the sum of "arable land", "permanent crops" and "permanent pastures". Data on "arable land and permanent crops" were obtained from FAOSTAT and used in the calculations. The data on "permanent pastures" were also obtained from FAOSTAT and multiplied by a factor derived by ESCWA using FASOTAT and Altapedia Online sources, the result of which was added to "arable land and permanent crops" to deduce the final value for "total cultivable land".

(# 27) Total cultivated land (ha)

This indicator is also referred to as "arable land and permanent crops". Data were obtained from FAOSTAT.

(# 28) Total irrigated land (ha)

This indicator is also referred to as "agricultural area irrigated". Data were obtained from FAOSTAT.

(# 29) Agricultural GDP (current prices)

The agricultural GDP obtained from national source and in national currency is divided by the official exchange rates. Both parameters were obtained from the twenty-sixth issue of Statistical Abstract of the ESCWA Region. (See: http://www.escwa.un.org/divisions.scu/statabs26/index.asp).

(# 30) Groundwater abstracted as a percentage of total water resources used (%)

This indicator is calculated by dividing "total groundwater abstraction" by "total water use".

(# 31, 33, 35) Domestic/agricultural/industrial water use as a percentage of total water use (%)

This indicator is calculated by dividing "mean annual water use for domestic/agricultural/industrial purposes" by "total water use".

(# 32, 34, 36) Per capita domestic/agricultural/industrial water use (m^3/p/y)

This indicator is calculated by dividing "mean annual water use for domestic/agricultural/industrial purposes" by the total population for that year.

(# 37, 38) Agricultural/cultivated land as a percentage of total land (%)

This indicator is calculated by dividing "total cultivable/cultivated land" by the total land.

(# 39) Irrigated land as percentage of cultivable land (%)

This indicator is calculated by dividing "total irrigated land" by "total cultivable land".

(# 40) Agricultural GDP as a percentage of total GDP (%)

This indicator is calculated by dividing "agricultural GDP" by "total GDP".

(# 41) Agricultural economic efficiency

This indictors equals to the ratio of "percentage share of agriculture in total GDP" to "employment in agriculture as a percentage of total employment". This indicator was obtained from AMF, AFESD, League of Arab States and OAPEC *Joint Arab Economic Report*, 2006.

(# 42, 43, 44) Urban/rural/total population with access to improved drinking water ('000)

Data were collected through a questionnaire sent by ESCWA to ministries and authorities responsible of water resources management in their respective countries. If ministries were unable to provide data, other sources were used, with priority given to national sources and United Nations publications. If data were unobtainable either from national sources or from other sources, but the indicator (in

percentage) on access to improved drinking water for urban/rural/total population was available, the latter was multiplied by the urban/rural/total population to estimate the actual figure. Since data segregating urban and rural population are only provided at intervals of five years through the official website of the United Nations Department of Economic and Social Affairs Population Division *World Population Prospects*, the population data for the closest year were used to estimate the indicator.

(# 45, 46, 47) Urban/rural/total population with access to improved sanitation ('000)

Data were collected through a questionnaire sent by ESCWA to ministries responsible of water resources management in their respective countries. If data were unobtainable either from national sources or from other sources, but the indicator (in percentage) on access to improved sanitation for urban/rural/total population was available, the latter was multiplied by the urban/rural/total population to estimate the actual figure. Since data segregating urban and rural population are only provided at intervals of five years through the official website of the United Nations Department of Economic and Social Affairs Population Division *World Population Prospects*, the population data for the closest year were used to estimate the indicator.

(# 48) Per capita use of fresh water resources (m^3/p/y)

This indicator is calculated by adding "per capita domestic water use", "per capita agricultural water use" and "per capita industrial water use".

(# 49, 50, 51) Urban/rural/total population with access to improved drinking water as a percentage of total urban population (%)

This indicator is calculated by dividing urban/rural/total population with access to improved drinking water by the urban/rural/total population for that year.

(# 52, 53, 54) Urban/rural/total population with access to improved sanitation water as a percentage of total urban population (%)

This indicator is calculated by dividing urban/rural/total population with access to improved sanitation by the urban/rural/total population for that year.

(# 55) Groundwater use intensity (%)

This indicator is calculated by dividing "total groundwater abstraction" by "mean annual groundwater recharge".

(# 56) Water deficit ((m^3/p/y))

This indicator is calculated by subtracting "per capita use of fresh water resources" from "per capita annual share from renewable water resources".

(# 57) Water stress (100 p/unit flow)

This indicator is calculated by dividing 1,000 by "per capita annual share from renewable water resources".

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