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OIC WATER REPORT 2015

SESRIC

ORGANISATION OF ISLAMIC COOPERATION
STATISTICAL ECONOMIC AND SOCIAL RESEARCH
AND TRAINING CENTRE FOR ISLAMIC COUNTRIES

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ABBREVIATIONS AND ACRONYMS

BAU	:	Business as Usual
ERWR	:	External Renewable Water Resources
FAO	:	Food and Agriculture Organization of the United Nations
IRWR	:	Internal Renewable Water Resources
IWMI	:	International Water Management Institute
MDGs	:	Millennium Development Goals
MENA	:	Middle East and North Africa
OIC	:	Organisation of Islamic Cooperation
SESRIC	:	The Statistical, Economic and Social Research and Training Centre for Islamic Countries
SUEN	:	Turkish Water Institute
TFWW	:	Total Freshwater Withdrawal
TRWR	:	Total Renewable Water Resources
UN	:	United Nations
UNGA	:	United Nations General Assembly
UNICEF	:	The United Nations Children's Fund
Water-CaB	:	SESRIC's Water Resources Management Capacity Building
WHO	:	World Health Organisation

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FOREWORD

Allah, may he be glorified and exalted, says in the holy Quran:"We have made from water every living thing"[1]. Water flows through our planet and through our bodies providing the source of life and the basis for social and economic development. Without water resources and the essential services they provide, achieving sustainable development, public health, food security, peace and human dignity remain elusive goals.

The demand for water in the OIC member countries is steadily increasing and is being spurred by population growth, increasing urbanization, raising incomes, growing economies, and new patterns in consumerism. This new and greater demand for water in the OIC member countries is transpiring when we consider the already limited water resources available in these countries. At the individual country level, the issue of water scarcity in OIC countries is bleak with almost half of them face different levels of water scarcity, namely absolute water scarcity, chronic water shortage and regular water stress. It is also worth mentioning that the pressure on water resources in OIC countries is estimated at 12.2%, a rate which far exceeds the 5.3% observed in non-OIC developing countries and the 9.0% observed in developed countries. This situation indicates the need for utilizing the available water resources in a more productive manner.

This state of affairs indicates the importance of identifying, analyzing and addressing all water-related challenges in OIC member countries. It is against this background that the OIC *Water Report 2015* comes out filling an important gap in water research publications in the OIC and presenting objective information and analyses on the current state and challenges facing OIC member countries in this important area. We pray Allah, the Almighty, that this report of SESRIC will be useful in expanding the body of knowledge in the OIC member countries in this field. We hope the report will contribute to the decision making process in OIC member countries in the domain of water through enacting appropriate policies and strategies that will enable the OIC countries to successfully address the water challenges they face.

Amb. Musa Kulaklikaya
Director General
SESRIC

[1] أَوَلَمْ يَرَ الَّذِينَ كَفَرُوا أَنَّ السَّمَاوَاتِ وَالْأَرْضَ كَانَتَا رَتْقًا فَفَتَقْنَاهُمَا ۖ وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ ۖ أَفَلَا يُؤْمِنُونَ.سورة الانبياء 30

EXECUTIVE SUMMARY

Water Availability

One of the major challenges facing OIC countries is limited water availability. The OIC share of the world's total renewable water resources is 13.3%, less than their share in the world's total population of 23.3%. This is in direct contrast to non-OIC developing countries and developed countries that enjoy a share of the world's total renewable water resources higher than their shares of the world's population. However, the 57 OIC member countries are dispersed over a huge land area in four continents with different climates where some of them enjoy high precipitation; while other suffer from very arid climate with closed hydrologic systems. Therefore, water availability in different OIC regions exhibits high variability. For example the OIC countries in East Asia have the highest amount of total renewable water resources (2,608 billion m^3), while OIC countries in the Middle East and North Africa have the lowest (361 billion m^3). At the individual country level; the highest amount of total renewable water resources is found in Indonesia (2.019 billion m^3/year) followed by Bangladesh (1.227 billion m^3/year) and Malaysia (580 billion m^3/year). On the other hand, the lowest amount of total renewable water resources is observed in Kuwait (0.02 billion m^3/year) followed by Maldives (0.03 billion m^3/year) and Qatar (0.06 billion m^3/year).

OIC countries in the Middle East and North Africa are home to many of the world's major aquifers containing non-renewable water resources. Since these countries suffer from arid climates where renewable water resources are limited, their non-renewable water resources or fossil water is considered an important strategic resource offering an opportunity to alleviate the limitation of renewable water resources, improve social welfare and facilitate economic development. It is not, therefore, surprising that the highest global utilisation rates of non-renewable water resources are recorded in these countries. For example, it is estimated that 77% of the total world extraction of non-renewable groundwater takes place in only two countries in this region, namely Saudi Arabia and Libya.

On the other hand, the inadequate water infrastructures in many OIC countries make the challenge of the limited water availability more serious. For example, dam capacity in OIC countries stands at 697 m^3/inhabitant, a rate which is lower than the 806 m^3/inhabitant observed in non-OIC developing countries; and significantly lower than the 1894 m^3/inhabitant observed in developed countries. Another example is water treatment facilities; the proportion of collected waste water that is treated in OIC countries is only 14.4%. Although this proportion is slightly higher than the 13.7% observed in non-OIC developing countries, it seriously lags behind that in developed countries where 75.4% of collected waste water is treated.

An important dimension of water availability is the proportion of available water that originates from outside the boarders of the country aka, "water dependency." In OIC countries, 73% of total renewable water resources are generated internally while 27% is generated externally, thus resulting in a dependency ratio of 27.4. The dependency ratio in OIC countries is higher than the 24.1 observed in non-OIC developing countries and the 6.7 ratio observed in developed countries.

Water Demand

The global demand for water is steadily increasing and is being driven by a number of anthropogenic factors of which population growth stands out as the main factor. Nowhere in the world does this factor exhibit its influence on increasing water demand than in OIC countries. The rate of population growth in OIC countries outpaces that in other country groups. Whereas the OIC share of the world population was 19.4% in the year 1990, it increased to 23.3% in the year 2015 and is projected to reach 25.8% in the year 2030. The increased demand for water in the OIC countries is also being driven by increasing urbanisation, increasing incomes and growing economies and new patterns in consumerism.

The demand for water in OIC countries far exceeds that in non-OIC developing countries. Whereas the annual total water withdrawal per capita in OIC countries is 622m^3/inhabitant/year; the figure in non-OIC developing countries stands at 391m^3/inhabitant/year. The demand for water shows large variances across regions and this is a reflection of many factors such as: income level, economic development level, availability of water resources and consumption behaviours. OIC countries in Latin America record the highest level of annual total water withdrawal per capita (1580m^3/inhabitant/year). Next in line are OIC countries in Europe and Central Asia with an annual total water withdrawal per capita of 1253m^3 and OIC countries in the Middle East and North Africa with 899m^3. The lowest annual total water withdrawal per capita is observed in OIC countries in Sub-Saharan Africa with a mere 158m^3,followed by OIC countries in East Asia with 515m^3 and OIC countries in South Asia with 672m^3.

The increasing demand for water in the OIC countries is placing unprecedented pressure on existing water resources. The pressure on water resources in OIC countries is 12.2% and far exceeds the 5.3% observed in non-OIC developing countries and the 9.0% observed in developed countries. The pressure on water resources is highest in OIC countries in the arid and dry region of the Middle East and North Africa, where pressure on water resources recorded an alarming value of 79.6%. Next in line are: OIC countries in Europe and Central Asia with pressure on water resources recorded at 33.6% and OIC countries in South Asia at 15.6%. On the other hand, OIC countries in Latin America, Sub-Saharan Africa and East Asia face low pressure on water resources estimated at 0.6%, 3.2% and 4.8% respectively. At the individual country level, pressure on water resources is the direst in nine countries, namely Kuwait, UAE, Saudi Arabia, Libya, Qatar, Bahrain, Yemen, Turkmenistan and Uzbekistan, where fresh water withdrawals exceed total renewable water resources.

The increasing demand for water and the resulting high pressure on existing water resources in the OIC countries indicate the importance of using water resources in the most possible productive manner. However, in OIC countries, each one cubic meter of total freshwater withdrawal corresponds to 4.3US$ of GDP. This compares poorly with water productivity in non-OIC developing countries where GDP per cubic meter of total freshwater withdrawal equals 6.3 US$, and is astronomically behind developed countries where GDP per cubic meter of total freshwater withdrawal equals 43.8 US$.

Water Scarcity

Water scarcity has many implications ranging from the social to the economical, but the most important implications are related to human security. The end result of water scarcity is unsatisfied demand leading to competition between water users, disputes, depletion of water resources and harm to the environment. Water scarcity is a fact of life in the arid and dry region of the Middle East and North Africa. OIC countries in this region have average annual total renewable water resources that stand at 913m^3 per capita which is below the threshold of 1,000m^3, and this puts them among the countries facing chronic water shortages. Although OIC countries in Europe and Central Asia, South Asia, and Sub-Saharan Africa do not, according to the definition, suffer from water shortage, they do suffer from low levels of total renewable water resources per capita which recorded at 3,319m^3, 4,164m^3, and 4,180m^3, respectively.

At the individual country level, the issue of water scarcity in OIC countries is bleak with almost half of them face different levels of water scarcity. More specifically, absolute water scarcity is observed in 14 OIC countries, namely Kuwait, United Arab Emirates, Qatar, Saudi Arabia, Yemen, Maldives, Bahrain, Libya, Jordan, Palestine, Algeria, Djibouti, Oman and Tunisia. Chronic water shortages are observed in six OIC countries, namely Egypt, Syria, Burkina Faso, Morocco, Lebanon and Sudan. Finally, water is also scarce in another six OIC countries that experience regular water stress, namely Pakistan, Somalia, Uganda, Comoros, Nigeria, and Uzbekistan.

Balancing Water Use and Food Production

As OIC countries undergo urbanizing and economic development, more demand for water will come from municipal and industrial use. Meeting the demand for water from municipal and industrial use is vital for OIC countries to achieve their development goals; however this carries the threat of diverting water resources from agricultural with all the negative and dangerous implications it has for food security.

Agricultural water use in OIC countries which accounts for 84% of all water withdrawal exceeds that observed in non-OIC developing countries (76%) and developed countries (39%). In OIC countries, municipal water use which accounts for 9% of all water withdrawal exceeds that of industrial water use which accounts for 7% of all water withdrawal. This is in direct contrast with what is observed in non-OIC developing countries, developed countries and the world, where industrial water use surpasses that of municipal water use.

At the OIC regional level, the highest agricultural use of water is observed in OIC countries in South Asia, where it accounts for 93% of all water withdrawals. OIC countries in Latin America and OIC Countries in the Middle East and North Africa follow with agricultural water withdrawals accounting for 87% and 86% of all water withdrawals respectively. On the other hand, the lowest agricultural water use is observed in OIC countries in East Asia, followed by OIC countries in Sub-Saharan Africa and OIC countries in Europe and Central Asia, where it accounts for 67%, 82%, and 83% of all water withdrawal respectively.

The highest level of industrial water use as a percentage of totals is observed in OIC countries in East Asia (21%) followed by OIC countries in Europe and Central Asia (9%), and OIC countries in Latin America (8%). When it comes to municipal water use, the highest level of use as a percentage of total is observed in OIC countries in Sub-Saharan Africa (13%), followed by OIC countries in East Asia (12%) and OIC Countries in Europe and Central Asia and OIC countries in the Middle East and North Africa (both 8%)

Water resources form the base of food production, and in this respect, irrigation can increase the yields of most crops significantly, thus irrigation holds the most potential for increasing food production and increasing food security. In spite of this fact, the area equipped for irrigation as a percentage of agricultural area in OIC countries (5.3%) is low when compared to non-OIC developing countries (7.3%) and the world average (6.1%). Since water resources in the OIC are already under considerable pressure, the use of efficient irrigation systems and techniques becomes paramount. However, the available data on the irrigation techniques used in the OIC countries indicate that surface irrigation, which is the most traditional and most water-consuming technique, is by far the most widely used technique, practised in 82.1% of the total area equipped for irrigation. Consequently, huge amounts of the water diverted for irrigation in these countries are wasted at the farm level through either deep percolation or surface runoff. In contrast, sprinkler irrigation which is more water-saving than surface irrigation is practised in 4.1% of the total area equipped for irrigation in the OIC countries, and localized irrigation technique, which is the most water-saving technique, is practised in only 1.7% of the total area equipped for irrigation in the OIC countries. Prevalence of the localized irrigation technique also varies across countries within the OIC region. United Arab Emirates and Jordan stand out with their remarkably high levels in use of this technique, reaching 86.3% and 81.2%, respectively. In addition to these two countries, the percentage is more than 10% in only 5 OIC countries, namely, Tunisia (16.9%), Kuwait (13.4%), Benin (12.4%), Bahrain (11.6%) and Qatar (10.9%). In contrast, the percentage is negligible in 34 OIC countries (less than 0.1%).

Access to Water and Sanitation Services

The OIC Water Vision identifies access to water and sanitation services as one of the major challenges still facing many OIC countries with water supply and sanitation services coverage ranging from very low to very high, with some nations providing universal access for all regions, while in other nations coverage is poor and adequate household services limited to well-established urban areas.

In spite of the success OIC countries recorded in providing access to improved drinking water sources in recent years, they still lag behind that of other country groups. Whereas, 83.7% of the population in OIC countries have access to improved water sources, the percentage is 91.3 in non-OIC developing countries and 99.6 in developed countries.

In developing countries, access to improved drinking water sources in rural and urban areas is lopsided with populations in urban setting enjoying higher rates of access. The lopsided access to improved drinking water sources is highest in OIC countries where 92.2% of urban population have access to improved drinking water sources compared to 75.6% for rural population, a gap of 16.6%. In non-OIC developing countries, the disparity in access to improved drinking water resources is smaller but still significant (a gap of 10.2%), while in developed countries access to improved drinking water sources is almost universal with very marginal differences in access regardless of rural and urban settings.

At the OIC regional level, access to improved drinking water source is not uniform. The highest access rates to improved drinking water sources are observed in OIC countries in Latin America (96.9% of the population), followed by OIC countries in Europe and Central Asia (93.1% of the population) and OIC countries in the Middle East and North Africa (91.2% of the population). On the opposite side, the lowest access rates to improved drinking water sources is observed in OIC countries Sub-Saharan Africa (68.9% of the population), followed by OIC countries in South Asia (86.5% of the population) and OIC countries in East Asia (88.6% of the population)

With all the progress made in improving access to water service, some OIC countries suffer from the fact that a significant proportion of their population still do not have access to improved drinking water sources. Case in point is Mozambique and Chad where almost half of the population is without access to improved drinking water sources. Furthermore, in 20 OIC countries the proportion of the population without access to improved drinking water sources exceeds 20%.

The success of developing countries in providing access to improved sanitation facilities is limited. In OIC countries, 61.7% of the population have access to improved sanitation facilities. This percentage is slightly lower than that observed in non-OIC developing countries (62.4%). Developed countries on the other hand have almost universal access to improved sanitation facilities.

Not only is the access to improved sanitation facilities limited in developing countries, but also the problem is compounded by the large disparities in access between urban and rural settings. The access to improved sanitation facilities in rural areas in developing countries significantly lags that in urban areas by 25.2% in OIC countries and 32.1% in non-OIC developing countries. In stark contrast, in developed countries the access rates are almost identical

OIC regions exhibit large variability in access to improved sanitation facilities. The highest access rates are observed in OIC countries in Europe and Central Asia (95.7% of population), followed by OIC countries in the Middle East and North Africa (88.5% of population) and OIC countries in Latin America (81.9% of population). On the other hand, the situation is quite dire in OIC countries in Sub-Saharan Africa where only 26.1% of the population have access to improved sanitation facilities. Also in OIC countries in South Asia and OIC countries in East Asia access to improved sanitation facilities is rather low, registering access rates of 59.7% and 64.6% respectively.

At the individual country level, access to improved sanitation facilities is uneven with some countries having large proportions of their population without access. In total, there are 20 OIC countries where more than half of the population are without access to improved sanitation facilities.

Implementation of the OIC Water Vision

The questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities" aimed to gather information on implementation of the OIC Water Vision; identify the key water-related challenges facing OIC countries; and learn about the future actions and strategies to address these challenges. As of August 2015, 17 OIC countries responded to the Questionnaire, corresponding to 30% of OIC member countries with representation from all major geographical regions. The majority of respondents indicated that they had received the OIC Water Vision document and the implementation of various recommended actions and activities is in progress. Besides, they had also adopted, updated, and /or evaluated comprehensive national strategies and plans on water issues since the adoption of the OIC Water Vision in March 2012. Regarding the major challenges, respondents show common general features and more than half of them mentioned six out of seven challenges listed in the OIC Water Vision as major threats to their water security. A significant number of respondents singled out water financing; lack of capacity and inadequate infrastructure as some of the major obstacles and difficulties facing them in the implementation of OIC Water Vision. Cooperation in the domain of water resources management is widely practiced among the respondents mainly through exchange programmes, development assistance, and trans-boundary water management activities. A significant number of respondents expressed their readiness to share their experiences in a range of water related fields such as capacity building, technology transfer and funding. Though majority of the respondents reported impacts of climate change on water resources, only half of them have been using a specific model to predict the future impacts and two third of them reported existence of mitigation and adaptation strategies for the climate change. Responding countries seemed to be well aware about their future challenges and almost all of them have strategies and commitments to achieve water security over the next 5-10 years.

1. Water Availability

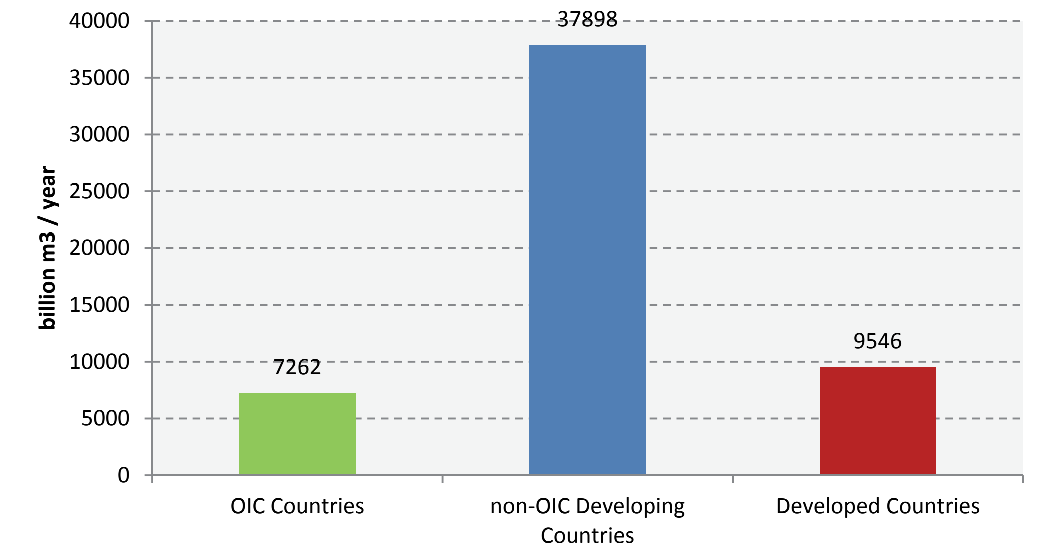
With over 70% of Earth's surface covered by water, the assumption would be that water is in abundance and the issue of water availability is of no relevance. However, 97.5% of all water on earth is salt water, leaving only 2.5% as fresh water – water that can theoretically be for used for drinking, hygiene, agriculture and industry. The majority of remaining fresh water (nearly 70%) is frozen in glaciers and ice caps in Antarctica and Greenland, thus rendering it inaccessible by humans.

Factors of natural and human nature affect the annual availability of water. Moreover, water volumes and their distribution over time and space are determined by climate and geomorphological conditions. The availability of water is significantly less than the water flowing into the system, and it fluctuates from time to time. This state of affairs highlights the importance of the issues of water availability and, thus, this chapter is devoted to examine the water resources, water availability, and means to increase water availability in OIC countries.

1.1. Renewable Water Resources

Renewable water resources are regenerated by precipitation. To measure renewable water resources the indicator Total Renewable Water Resources (TRWR) is used. This indicator provides the long-term average water availability for a country in cubic kilometres (billion m^3) of precipitation, recharged ground water, and surface inflows from surrounding countries. Figure 1.1 shows the total renewable water resources (TRWR) in OIC countries in comparison to other country groups.

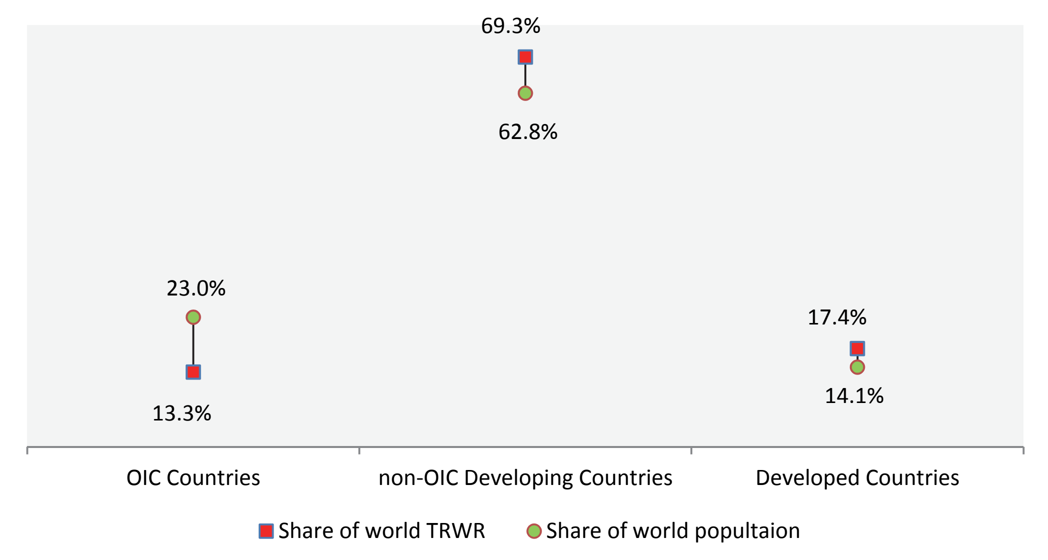
FIGURE 1.1
Total Renewable Water Resources (TRWR), 2014



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

Total renewable water resources are 7,262 billion m^3 in OIC countries, 37,898 billion m^3 in non-OIC developing countries and 9,546 billion m^3 in developed countries. Total renewable water resources in OIC countries are rather modest when compared to the OIC population as Figure 1.2 indicates.

FIGURE 1.2
Share of World TRWR & Population, 2014

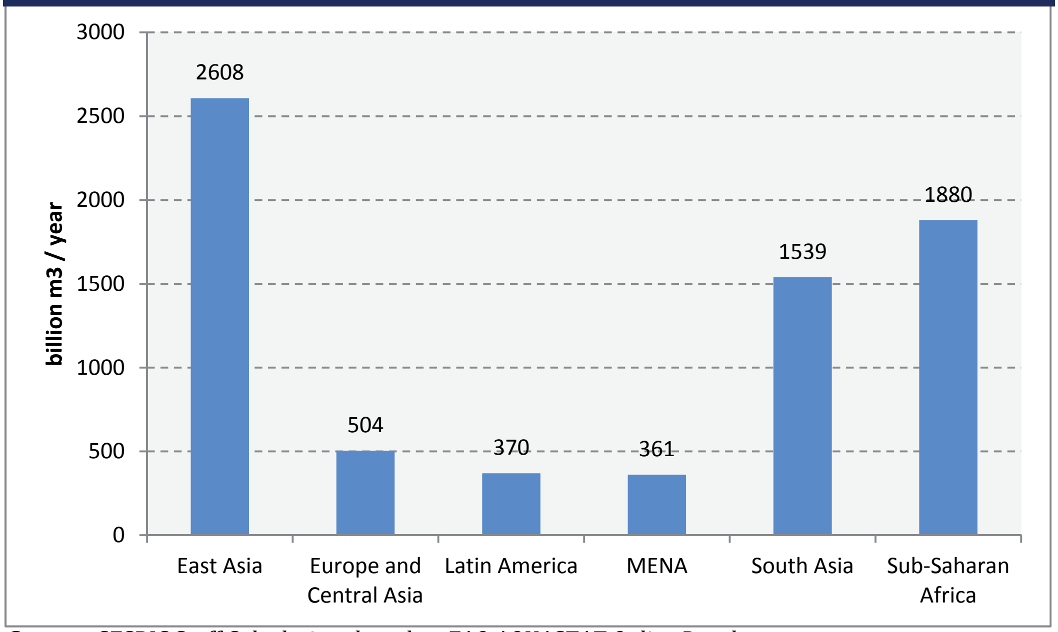


Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

The share of OIC countries in the world's total renewable water resources is 13.3%, which is less than their share in the world total population of 23.3%. In contrast non-OIC developed countries and developed countries share of the world's total renewable water resources are higher than their share of the world's population. Non-OIC developing countries share of the world's total renewable water resources is 69.3% while their share of the world's population is 62.8%. Also, developed countries share of the world's total renewable water resources is 17.4% while their share of the world's population is 14.1%.

Rainfall translates in river off and aquifer recharge, the two main sources of water; however, OIC countries have a large range of climates with high variability in rainfall. Some parts like East Asia and Bangladesh have high precipitation, while other parts like the Middle East and North Africa has a very arid climate with closed hydrologic systems. On the high side there is Malaysia which enjoys an average precipitation of 2,875mm/year, while on the low side there is Egypt that has an average precipitation of 51 mm/year *(FAO AQUASTAT Online Data Base, 2014)*. The result is that water resources have a very uneven distribution among the OIC regions as shown in Figure 1.3

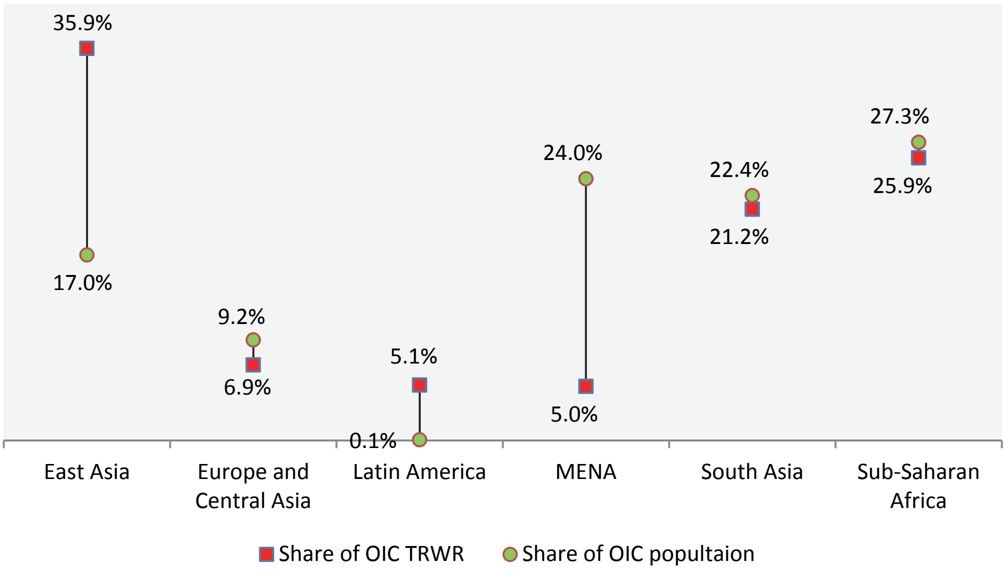
FIGURE 1.3
Total Renewable Water Resources (TRWR) in OIC Regions, 2014



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

Figure 1.3 shows that the highest amount of renewable water resources is observed in OIC countries in East Asia region with 2,608 billion m^3 while the lowest is observed in the OIC countries in the Middle East and North Africa (MENA) with a mere 361 billion m^3. To put the above figures into proper perspective it is useful to compare the total renewable water resources in OIC regions to the corresponding population in those regions as shown in Figure 1.4.

FIGURE 1.4
Share of OIC Regions in the OIC Total Population & TRWR, 2014



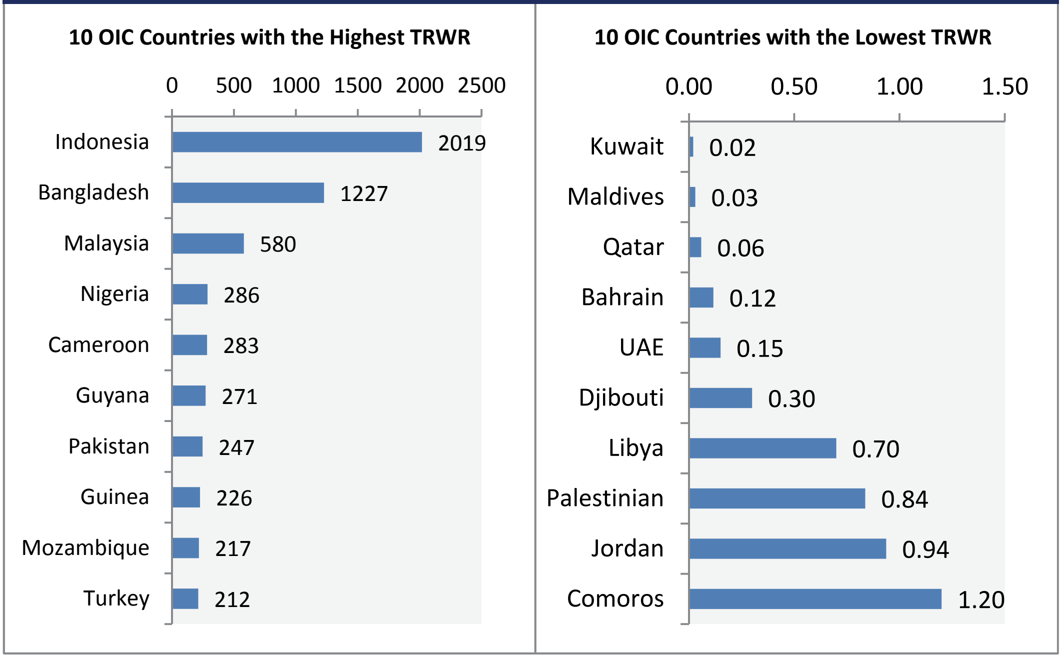
Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

The Figure shows two sets of OIC regions. In one set; there are the OIC regions that have a share of renewable water resources higher than their share of the total OIC population. In this set there are OIC countries in East Asia that enjoy 35.9% of the total renewable water resources in the OIC countries while being home to only 17% of the total OIC population. OIC countries in East Asia are then followed by OIC countries in Latin America that possess 5.1% of the OIC total renewable water resource while being home to the very small fraction of 0.1% of the total OIC population. In the other set of OIC regions; the share of OIC total renewable water resources is less than the share of the total OIC population. This set is composed of the following: OIC countries in Europe and Central Asia (6.9% of OIC TRWR and 9.2% of OIC population), OIC countries in the Middle East and North Africa (5.0% of OIC TRWR and 24.0% of OIC population), OIC countries in South Asia (21.2% of OIC TRWR and 22.4% of OIC population), and OIC countries in Sub-Saharan Africa (25.9% of OIC TRWR and 27.3% of OIC population).

Likewise, the OIC regions shown in Figure 1.4 can be grouped according to the difference between their share of the OIC total renewable water resources and their share of the total OIC population. According to this grouping, three different sets of OIC regions are formed which are: minimal difference, moderate difference, and large difference. In the minimal difference set the countries share of the OIC total renewable water resources is a near match to their share of the OIC total population and this set of countries includes OIC countries in Europe and East Asia, OIC countries in South Asia, and OIC countries in Sub-Saharan Africa. The moderate difference set includes OIC countries in Latin America, and the large difference set includes OIC countries in East Asia and OIC countries in the Middle East and North Africa.

At the individual country level, water availability exhibits high variance among OIC countries as Figure 1.5 demonstrates.

FIGURE 1.5
OIC Countries with the Highest and Lowest Total Renewable Water Resources (TRWR, billion m^3/year), 2014



Source: *FAO AQUASTAT Online Database.*

As the figure shows the highest amount of total renewable water resources is found in Indonesia (2.019 billion m^3/year) followed by Bangladesh (1.227 billion m^3/year) and Malaysia (580 billion m^3/year). On the other hand, it is observed that the majority of the OIC countries with the lowest amount of total renewable water resources are located in the Middle East and North Africa, such as Kuwait (0.02 billion m^3/year) and Qatar (0.06 billion m^3/year).

1.2. Non-Renewable Water Resources

Non-renewable, or fossil, water is the accumulated underground water which is the heritage of previous more humid climatic conditions that existed thousands of years ago. As Table 1.1 shows, OIC countries in the Middle East and North Africa and OIC countries in Sub-Saharan Africa are home to many of the world’s major aquifers containing non-renewable water resources. Since these countries suffer from arid climates where renewable water resources are limited, their non-renewable water resources or fossil water is considered an important strategic resource.

TABLE 1.1
Major Aquifers Containing Predominantly Non-Renewable Ground Water Resources

Country	Aquifer System	Extension (km^2)	Exploitable Reserves (Mm^3)	Current Extraction (Mm^3/year)
Egypt, Libya, Sudan, Chad	Nubian Sandstone	2,200,000	14,460,000	2,170,000
Algeria, Libya, Tunisia	North Western Sahara	1,000,000	1,280,000	2,560
Algeria, Libya, Niger	Murzuk Basin	450,000	60 to 80,000	1,750
Mauritania, Senegal, Gambia	Maastrichtian	200,000	480 to 580,000	265
Mali, Niger, Nigeria	Iullemeden Multilayer Continental	500,000	250,000 to 2,000000	225
Niger, Nigeria, Chad, Sudan, Cameroon, Libya	Chad Basin	600,000	170 to 350,000	250
Saudi Arabia, Bahrain, Qatar, UAE	Various	225,000 to 250,000	500,000 to 2,185,000	13,790
Jordan (only)*	Al Disi Aquifer	3,000	6,250	170

* Extends into Saudi Arabia, where it is included in the entry above

Source: *Adopted from UNESCO, 2006. Non-Renewable Ground Water Resources: A Guide book on Socially Sustainable Management for Water Policy Makers.*

In the more arid climates of the Middle East and North Africa region, the use of non-renewable groundwater offers an opportunity to alleviate the limitation of renewable water resources, improve social welfare and facilitate economic development. It is for this reason that the global utilisation of non-renewable water resources is the highest in this region. Table 1.2 demonstrates the extent to which the OIC countries located in this region are reliant on non-renewable ground water resources.

TABLE 1.2
Exploitation of Non-Renewable Ground Water Resources

Country	Year(s) of Estimate	Groundwater (Mm^3/year)		
		Share of Demand*	Total Use	Non-Renewable
Algeria	2000	54%	2,600	1,680
Saudi Arabia	1999 (1996)	85%	21,000	17,800
Bahrain	1999 (1996)	63%	258	90
Egypt	1999 (2002)	7%	4,850	900
UAE	1999 (1996)	70%	900	1,570
Jordan	1999 (1994)	39%	486	170
Libya	1999	95%	4,280	3,014
Oman	1999 (1991)	89%	1,644	240
Qatar	1999 (1996)	53%	185	150
Tunisia	2000	59%	1,670	460
Yemen	1999 (1994)	62%	2,200	700

* Proportion of the total actual water demand met from underground water

Source: *Margat (1995, 1998, 200), UN-FAO (1997), UN-ECSWA (1999) – as cited in UNESCO, 2006.*

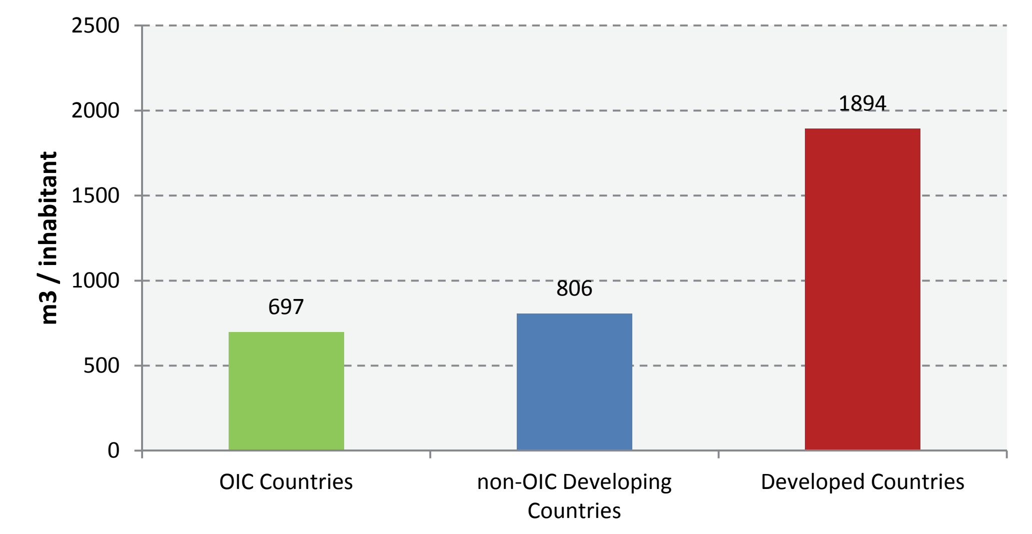
As the table clearly demonstrates, the global mining of non-renewable groundwater is concentrated in Saudi Arabia and Libya, which together account for 77% of the estimated total world extraction of non-renewable groundwater. In the arid areas of the Middle East and North Africa, groundwater is a source of life and is used for both urban water supply and for irrigated agriculture. However, unplanned depletion of non-renewable groundwater reserves can undermine, and potentially erode, the economic and social vitality of OIC countries in the Middle East and North Africa. The challenge for these countries is to find a balance between preservation and use. Thus the need to plan the utilisation of non-renewable water resources and the preparation for dealing with water stress as aquifer storage is depleted becomes paramount.

1.3. Dam Capacity

An important factor in water supply or water availability is dams. Dams are designed to store water during the wetter parts of the year, so that there is a continuous supply of water for the drier seasons. In addition, dams provide hydropower and provide some level of protection from extreme precipitation events that otherwise would result in floods. This is particularly important for countries in which the available water during the wet and dry seasons varies considerably. Dams may also allow for the excess runoff that would normally flow to the ocean without being used to become available for use.

Figure 1.6 shows the total cumulative storage capacity of dams per capita in OIC countries in comparison to other country groups.

FIGURE 1.6
Dam Capacity per Capita

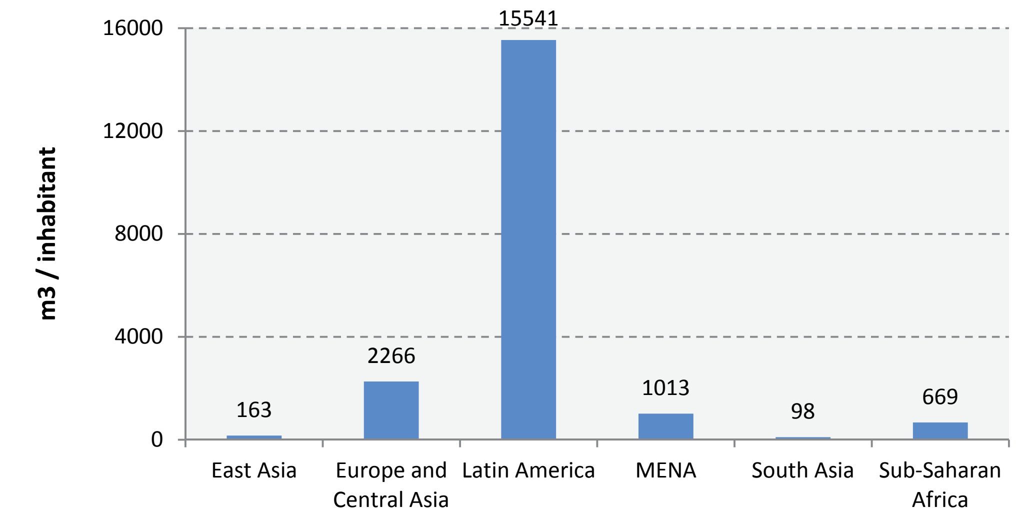


Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 1993-2015 was used for the calculations. Data was available for a total of 145 countries of which 47 are OIC member states.*

The values in the Figure indicate the sum of the theoretical initial capacities of all dams, which does not change over time. The amount of water stored within any dam is likely less than the capacity due to silting. Data on small dams may not be included, although their aggregate storage capacity is generally not significant. As the figure shows, dam capacity in OIC countries stands at 697 m^3/inhabitant, which is lower than the 806 m^3/inhabitant observed in non-OIC developing countries, and significantly lower than that observed in developed countries (1894 m^3/inhabitant).

Dam capacity per capita varies greatly among OIC regions as Figure 1.7 clearly demonstrates.

FIGURE 1.7
Dam Capacity per Capita in OIC Regions



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 1993-2015 was used for the calculations. Data was available for a total of 47 OIC member states.*

OIC countries in Latin America, namely Suriname and Guyana, who enjoy relatively plentiful water resources and small populations, have very high dam capacity per capita (15,541 m^3/inhabitant.) They are followed by OIC countries in Europe and Central Asia with an average dam capacity of 2,266 m^3/inhabitant and OIC countries in the Middle East and North Africa with an average dam capacity of 2,266 m^3/inhabitant. The lowest dam capacities per capita are observed in OIC countries in south Asia with a mere average dam capacity of 98 m3/inhabitant, followed by OIC countries in East Asia (163 m^3/inhabitant) and finally OIC countries in Sub-Saharan Africa (669 m^3/inhabitant).

1.4. Water Dependency

One issue related to water availability that has strategic and security implications is the source of available water. Water can be generated from within the borders of a country (internal water resource) or can be trans-boundary in nature meaning that it originates from outside the boarders of a country (external water resources). While holding a potential for conflict and disagreements, trans-boundary water provides opportunities for cooperation and promotion of regional peace and security as well as economic growth.

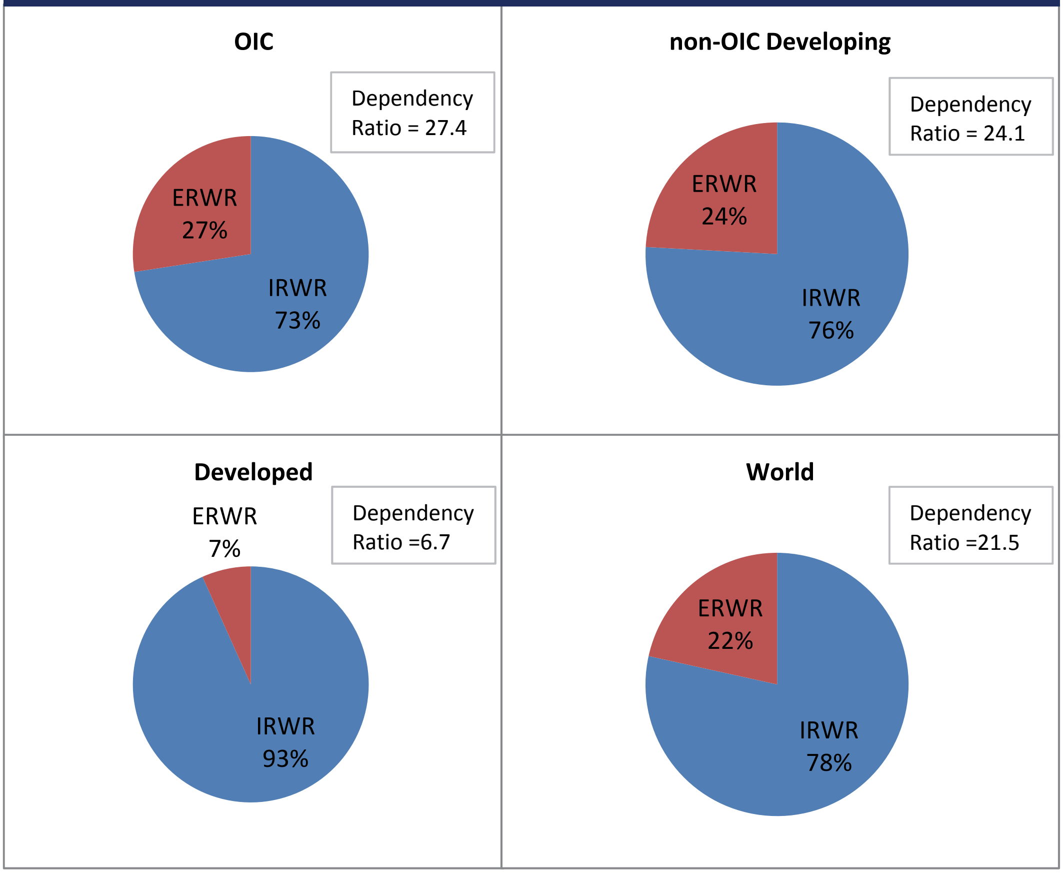
Water dependency is measured by dividing external renewable water resources (ERWR) by the total renewable water resources (TRWR), where the total renewable water resources are the summation of both internal renewable water resources (IRWR) and external renewable water resources (ERWR). In equation form, water dependency is given as follows:

$$Water\ Dependency\ Ratio = \frac{ERWR}{IRWR + ERWR} \times 100$$

Water dependency may theoretically vary between 0 and 100. A country with a dependency ratio equal to 0 does not receive any water from neighbouring countries. A country with a dependency ratio equal to 100 receives all its renewable water from upstream countries, without producing any of its own.

OIC experiences a higher degree of water dependency when compared with other country groups as shown in Figure 1.8.

FIGURE 1.8
Water Dependency, 2014



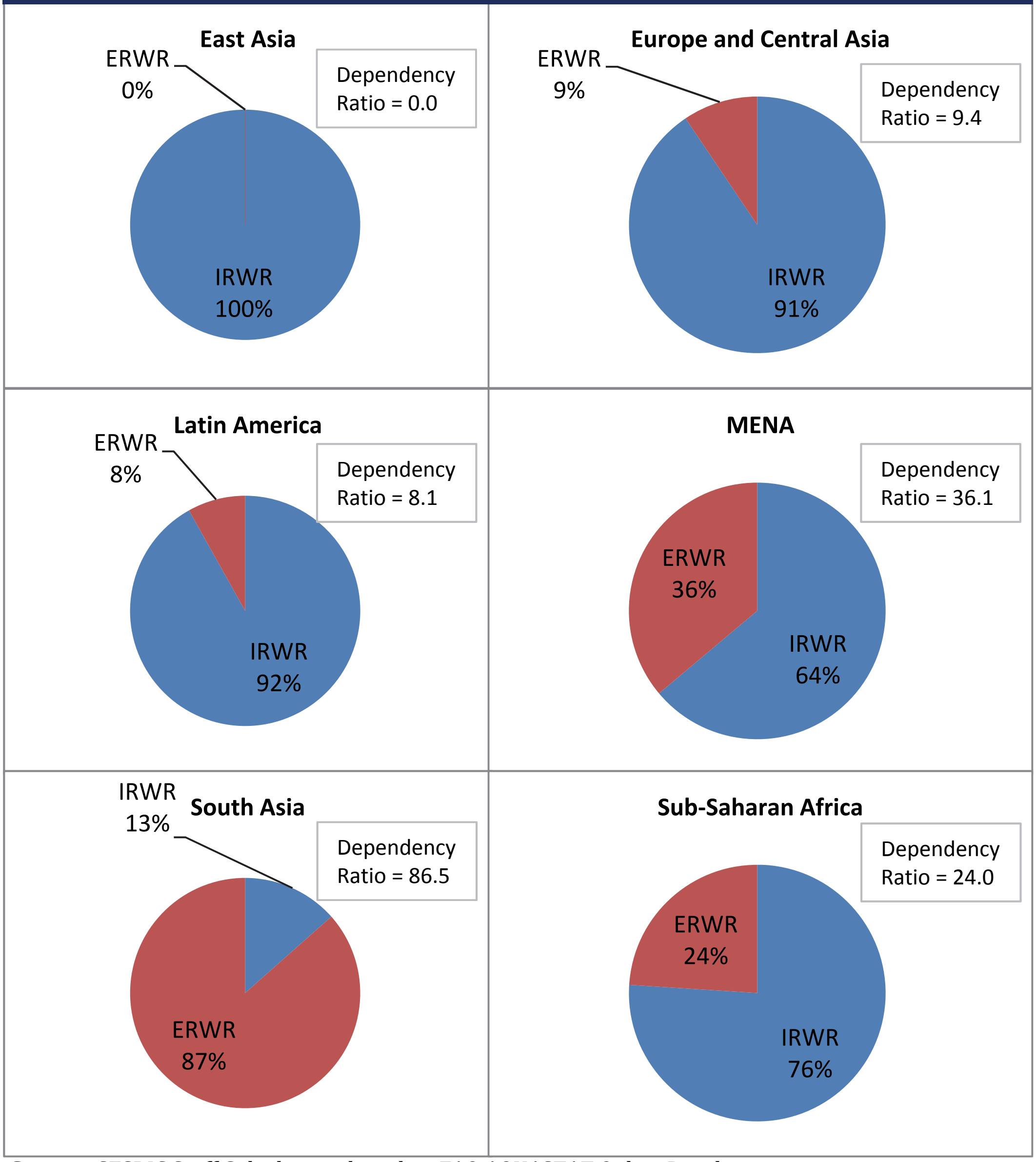
Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

In OIC countries, 73% of total renewable water resources are generated internally while 27% are generated externally, thus resulting in a dependency ratio of 27.4, which is higher than the 24.1 observed in non-OIC developing countries and the 6.7 ratio observed in developed countries.

The highest level of water dependency is observed in OIC Countries in South Asia (86.5) followed by OIC countries in the Middle East and North Africa (36.1) and OIC countries in

Sub-Saharan Africa (24.0). On the opposite side of the scale, OIC countries in East Asia are totally independent when it comes to water resources. OIC countries in Latin America and OIC Countries in Europe and Central Asia exhibit relatively low degrees of water dependency having dependency ratios of 8.1 and 9.4 respectively.

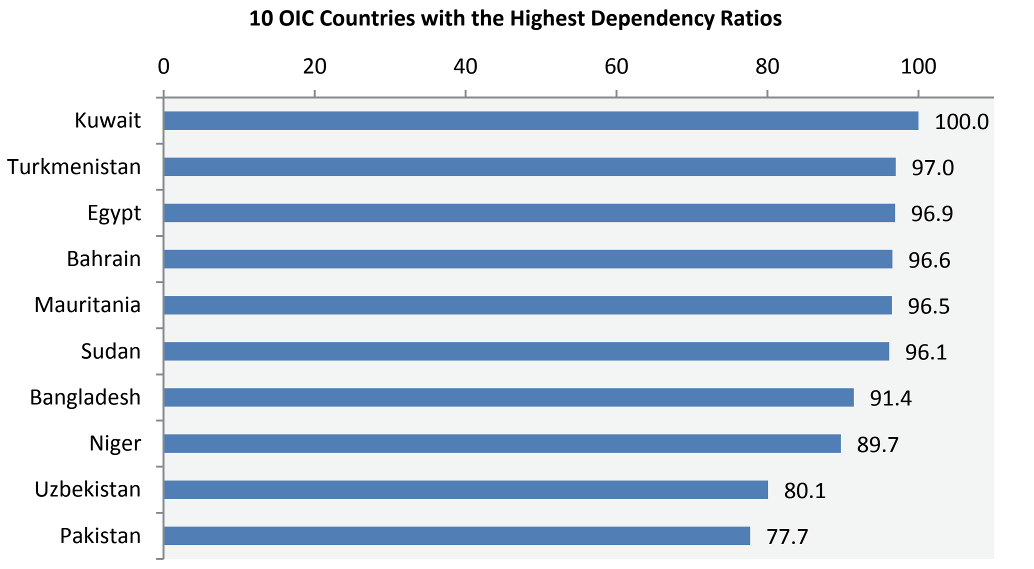
FIGURE 1.9
Water Dependency in OIC Regions, 2014



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database.*

At the individual country level, water dependency varies widely with some countries highly dependent on external waters and other totally water-independent. As Figure 1.10 shows, Kuwait has the highest level of water dependency. Kuwait is followed by Turkmenistan that has a water dependency ratio of 97.0 and Egypt that has a water dependency ratio of 96.9.

FIGURE 1.10
10 OIC Countries with the Highest Degree of Water Dependency



Source: *FAO AQUASTAT Online Database.*

In contrast, many OIC countries have low water dependency ratios. These countries are listed in Table 1.3

TABLE 1.3
OIC Countries with the Lowest Degree of Water Dependency

OIC Countries with Zero Dependency Ratios		
Brunei Darussalam	Comoros	Djibouti
Guinea	Indonesia	Libya
Malaysia	Maldives	Morocco
Oman	Saudi Arabia	Sierra Leone
Suriname	United Arab Emirates	Yemen
Zero <OIC Countries with Dependency Ratios < 5		
Lebanon	Kyrgyzstan	Gabon
Turkey	Palestine	Qatar
Cameroon	Algeria	
5 <OIC Countries with Dependency Ratios < 10		
Iran	Burkina Faso	Côte d'Ivoire
Tunisia		

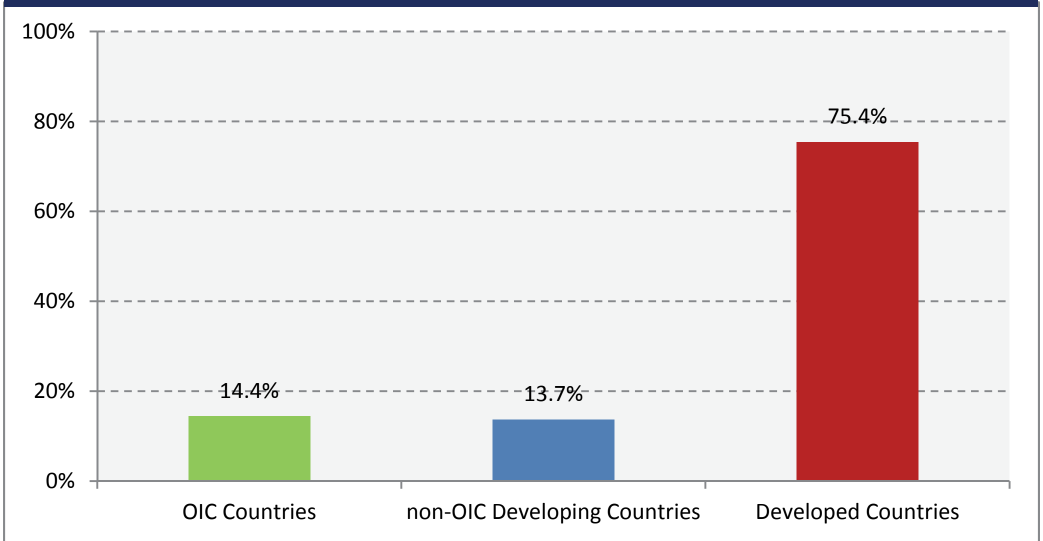
Source: *FAO AQUASTAT Online Database.*

1.5. Increasing Water Availability

Water availability is not restricted to natural factors; human factors play an important role in determining water availability. Thus, specific human interventions can have a role in increasing water availability. Water storage whether in the conventional method of dams, or the less conventional method of underground water storage increase the availability of water on a regular basis and especially in dry seasons were otherwise water would have been absent. Also, water storage is a prerequisite for allowing the transfer of water from high precipitation regions to low precipitation regions. To supplement the role of dams and underground water storage, water catchments can be deployed. With the construction of more water catchment areas, more rainfall can be collected and made available for use.

Water availability can also be enhanced through the import of water into a system. The main options for importing water into a system include: inter-basin transfers, desalinisation of sea water and the use of waste water. Waste water is comprised of domestic grey-water (water from baths, sinks, washing machines, and kitchen appliances) and black-water (water from toilets), as well as industrial wastewater that may have additional chemical contaminants. The use of waste water requires the treatment of collected waste water, and in this regard OIC countries have a large opportunity to improve as illustrated by Figure 1.11.

FIGURE 1.11
Proportion of Collected Waste Water that is Treated

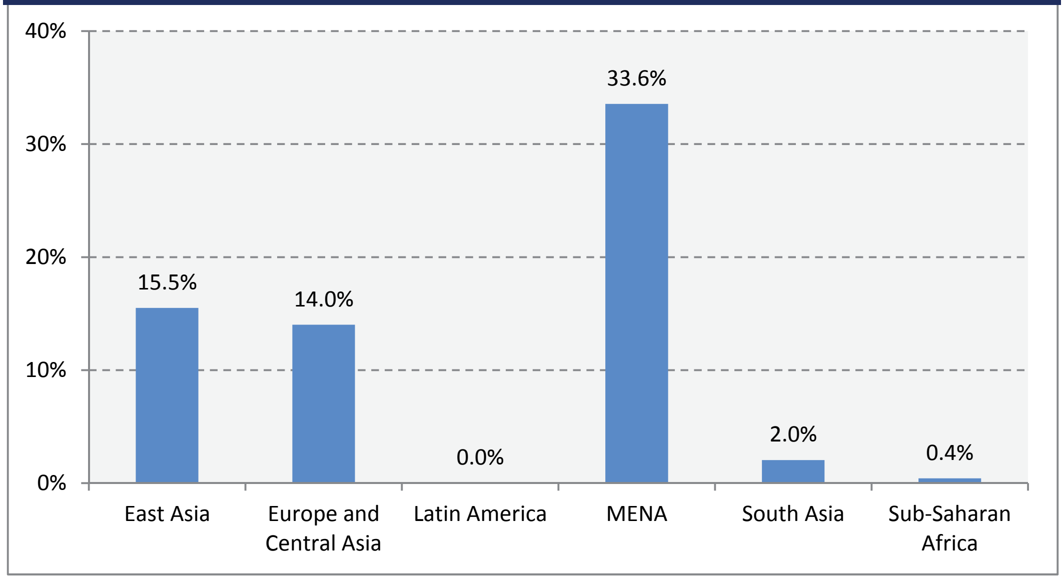


Source: *SESRIC Staff Calculations based on Yale University 2014 Environmental Performance Index. Values were calculated using simple average*

In OIC countries, the proportion of collected waste water that is treated is only 14.4%. Although this proportion is slightly higher than the 13.7% observed in non-OIC developing countries, it seriously lags behind that in developed countries where 75.4% of collected waste water is treated.

At the OIC regional level, the proportion of collected waste water that is treated is 33.6% in OIC countries located in the Middle East and North Africa and this percentage is the highest among OIC regions (see Figure 1.12) The second and third highest proportions of collected waste water that is treated are found in OIC countries located in East Asia (15.5%) and OIC countries in Europe and Central Asia (14.0%) respectively. In the remaining OIC regions, the proportion of collected waste water that is treated is zero or close to zero. To be more specific; the proportion of collected waste water that is treated in OIC countries located in Latin America is 0%, in OIC countries located in Sub-Saharan Africa is 0.4% and in OIC countries located in South Asia is 2.0%.

FIGURE 1.12
Proportion of Collected Waster Water that is Treated in OIC Regions



Source: *SESRIC Staff Calculations based on Yale University 2014 Environmental Performance Index. Values were calculated using simple average*

By increasing their waste water treatment capacities, OIC countries can increase water availability. In addition to increasing water availability, the practice of waste water treatment contributes to the health of aquatic systems and provides health benefits for local residents.

Finally, water availability is affected by the issue of water quality. Poor water quality reduces the availability of water of required quality level for given uses. Human activities introduce materials and elements that adversely affect water quality such as: organic matter, heavy metals, and fertilizers. Moreover, naturally occurring chemicals affect water quality. For example, in Bangladesh there is the problem of natural contaminants such as arsenic. Therefore, the mind-set used in water resources management needs to seriously consider the issue of pollution control as an important element of water supply management strategies.

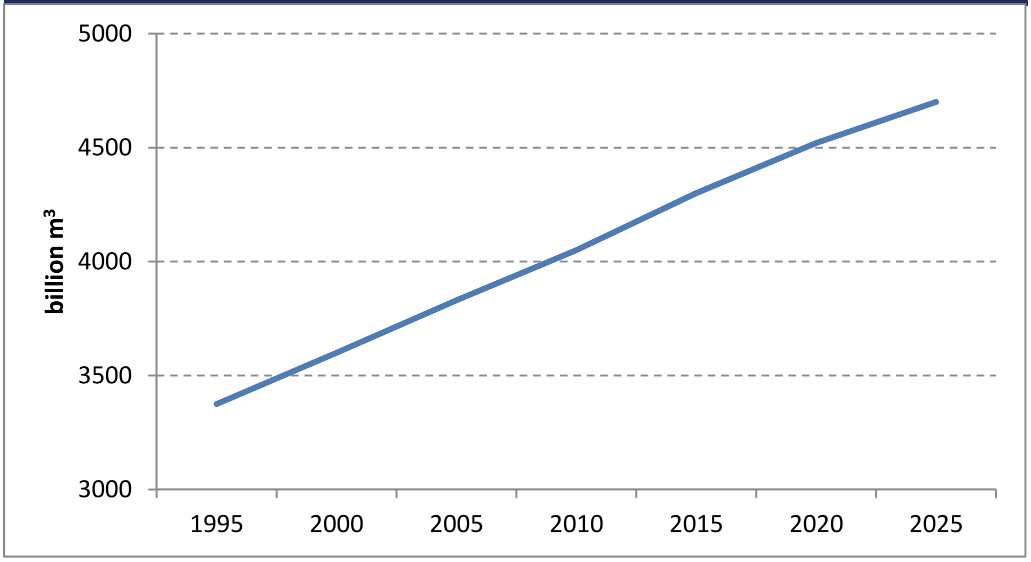
2. Water Demand

IF oil was the strategic commodity of the 20th century, then probably water stands to replace it as the commodity of the 21st century. The demand for water has been increasing steadily and does not show signs of relenting, and this in turn is placing unprecedented pressure on water resources. Factors driving water demand are all anthropogenic (human) by nature. Population growth and consumerism (as a social and economic order, and as an ideology that encourages the acquisition of goods and services in ever-increasing amounts) directly increase demand for goods and services, and the water associated with their production, processing and delivery. This increased demand is observed across all water using sectors; namely, agricultural sector, industrial sector and the municipal sector. Against this backdrop this chapter starts off by discussing factors driving the demand for water before moving on to discussing water withdrawals and pressure on water resources before concluding with the subject of managing water demand.

2.1. Factors Driving the Demand for Water

The upward trend in water demand is projected to continue into the foreseeable future as Figure 2.1 reveals. The values in the figure are based on FAO's AQUASTAT database and assume the Business as Usual Scenario (BAU). The BAU scenario in essence assumes that the water use patterns will not change.

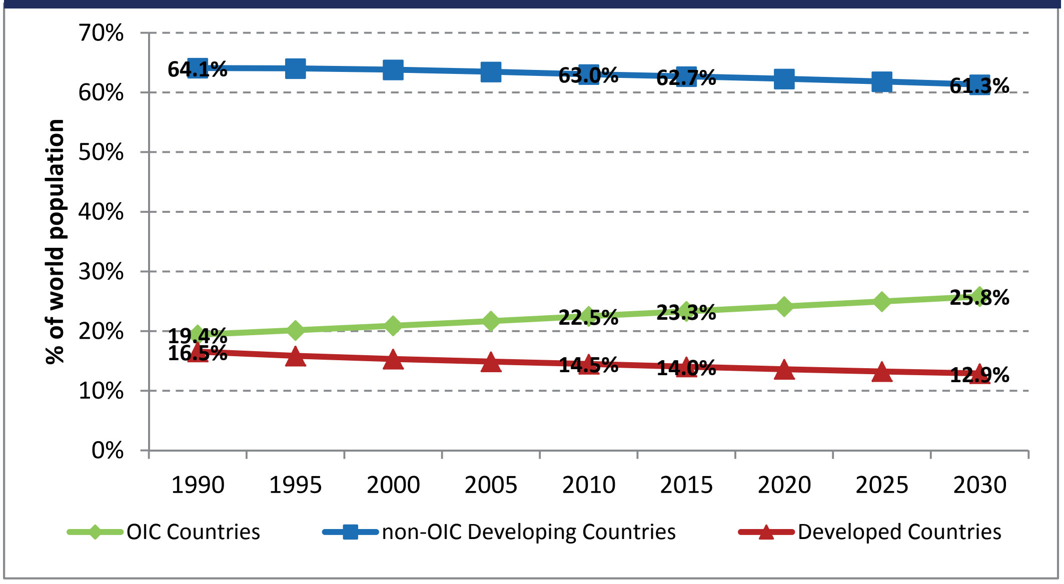
FIGURE 2.1
Water Demand Trends



Source: *Adopted from IWMI, 2014*

At the forefront of factor driving the demand for water is population growth. World population is projected to increase by 1.2 billion people in the next 15 years from an estimated 7.3 billion people in 2015 to 8.4 billion people in 2030 (Based on the UN Population Division's estimates and projections). The increase in water demand driven by population growth is of high relevance to OIC countries in particular since the rate of population growth in OIC countries outpaces that in other country group as show in Figure 2.2

FIGURE 2.2
Trends in World Population



Source: *SESRIC Staff Calculations based on UN Population Division Estimates and Projections*

The figure shows that the share of OIC countries in world population is continuously increasing from an estimated 19.4% in the year 1990 to a projected 23.3% in the year 2015 and 25.8% in the year 2030. In contrast, the share of non-OIC developing countries and developed countries in the world population is in steady decline. The share of non-OIC developing countries in the world population is projected to decline from 64.1% in the year 1990 to 62.7% in the year 2015 to 61.3% in the year 2030. As for developed countries, their share in the world population is projected to decline from 16.5% in the year 1990 to 14.0% in the year 2015 to 12.9% in the year 2030. These figures highlight the demographic pressure on water resources in OIC countries.

Population growth is not the only factor which drives demand for water as evident by the fact that water demand has been growing at more than twice the rate of population increase in the last century (FAO, 2008.) As incomes increase and economies grow so does the demand for water. The increase in water demand is across the board; from municipal, to agriculture to industrial use. Income increase and economic growth leads to increased production and consumption of manufactured good, electric power, and services all of which raise demand for water. Also as incomes increase, people diets undergo significant changes. People start eating more meat and dairy product which require more water to produce than a diet based on staple crops (i.e. cereals). It is expected that the global average food supply will rise from 2650 kcal/person/day in 2006 to above 3000 kcal/person/day in 2050. These per-capita figures translate into an additional one billion tonne of cereals and 200 million tonnes of meat to be produced annually (Bruinsma, 2009)

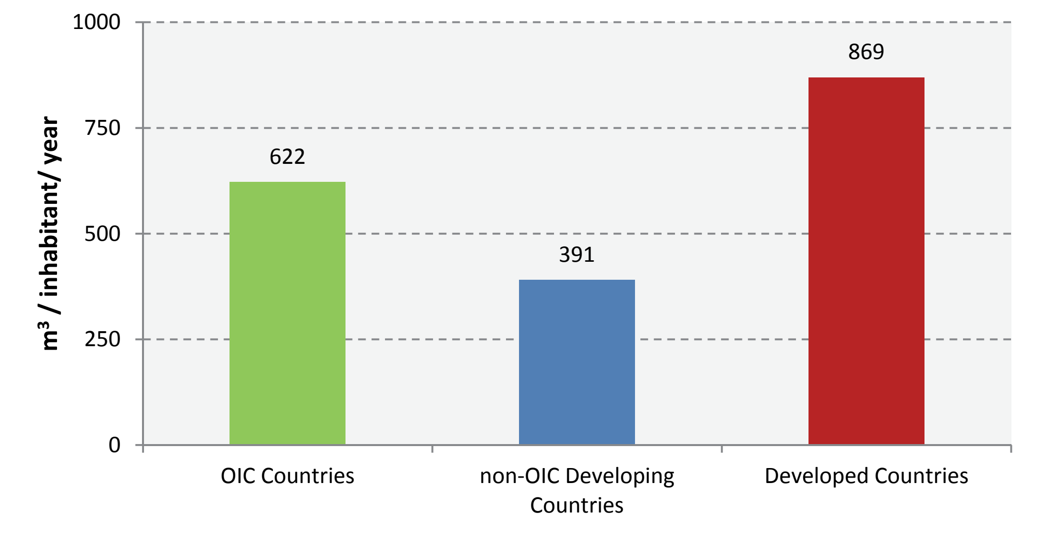
Another factor driving water demand is urbanization. The urbanization factor is of high relevance to developing countries which are experiencing higher rates of urbanization when compared to developed countries. As urbanization increases so does the length of the food chain which results in more food wastage. It is estimated that global agricultural production would need to grow by 60 percent between 2006 and 2050 to keep up with food demand and that both the proportion of cropland under irrigation, and the share of irrigated production will increase, resulting in greater demand for agricultural water (Bruinsma, 2009).

2.2. Water Withdrawal

To measure the demand for water the indicator “Total Water Withdrawal” is used. Total water withdrawal is the annual quantity of water withdrawn for agricultural, industrial and municipal purposes. It includes renewable freshwater resources, as well as potential over-abstraction of renewable groundwater or withdrawal of fossil groundwater, and potential use of desalinated water or treated wastewater. It does not include in stream uses, which are characterized by a very low net consumption rate, such as recreation, navigation, hydropower, inland capture fisheries, etc.

Figure 2.3 shows the annual total water withdrawal per capita in OIC countries in comparison with country groups.

FIGURE 2.3
Annual Total Water Withdrawal per capita

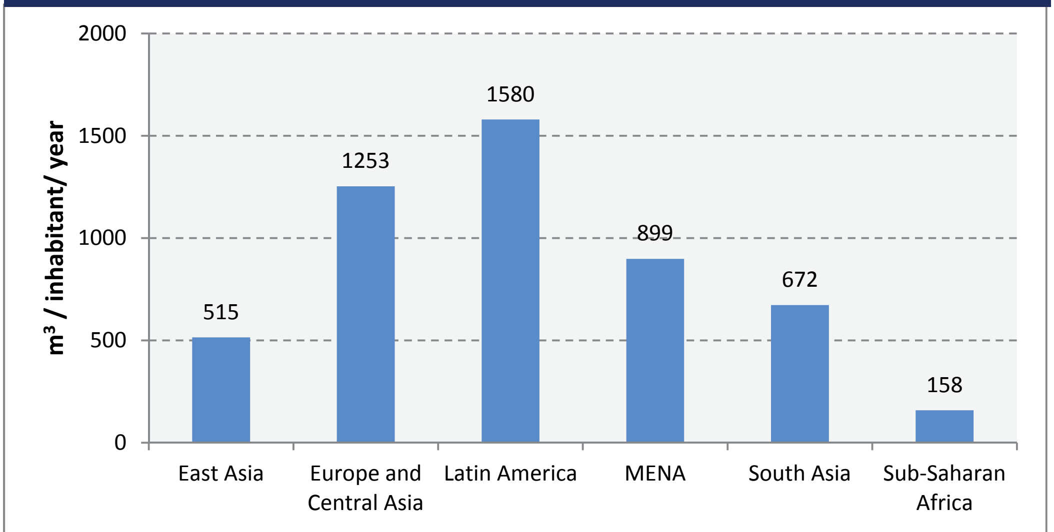


Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 2000-2014 was used for the calculations.*

The demand for water in OIC countries far exceeds that in non-OIC developing countries but is still significantly lower than that observed in developed countries. As Figure 2.3 shows, the annual total water withdrawal per capita in OIC countries is 622m^3/inhabitant/year; while in non-OIC developing countries it is 391m^3/inhabitant/year, and in developed countries it is 869m^3/inhabitant/year.

OIC regions shows large variances in their annual total water withdrawal per capita (see Figure 2.4) and this is a reflection of many factors such as: income level, economic development level, availability of water resources and consumption behaviours.

FIGURE 2.4
Annual Total Water Withdrawal per capita in OIC Regions



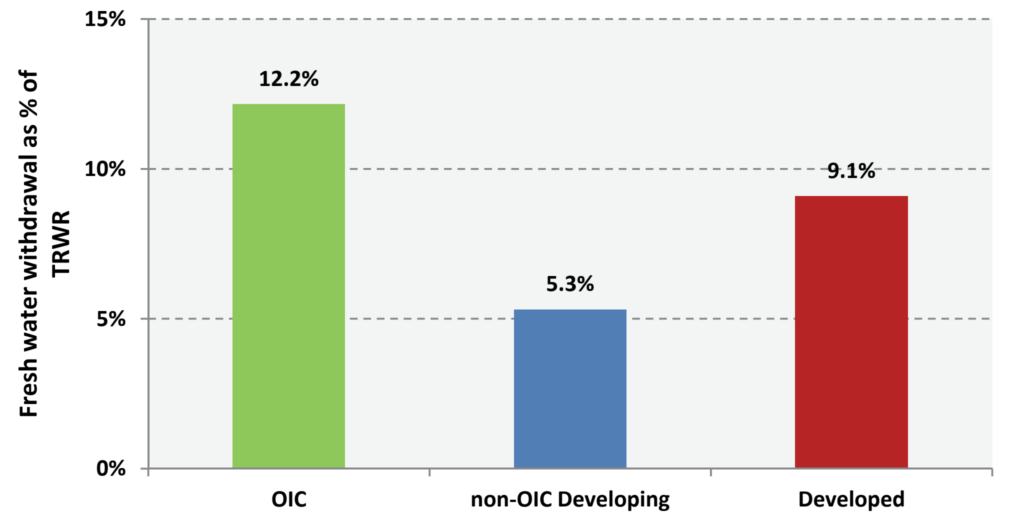
Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 2000-2014 was used for the calculations.*

OIC countries in Latin America record the highest level of annual total water withdrawal per capita (1580m^3/inhabitant/year). Next in line are OIC countries in Europe and Central Asia with an annual total water withdrawal per capita of 1253m^3 and OIC countries in the Middle East and North Africa with 899m^3. The lowest annual total water withdrawal per capita is observed in OIC countries in Sub-Saharan Africa with a mere 158m^3 followed by OIC countries in East Asia with 515m^3 and OIC countries in South Asia with 672m^3.

2.3. Pressure on Water Resources

The demand for water is continuously increasing as was demonstrated in section 2.1. The increased demand for water puts pressure on the existing water resources. Total freshwater withdrawal (TFWW) in a given year, expressed in percentage of the actual total renewable water resources (TRWR) is used as an indication of the pressure on the renewable water resources. Figure 2.5 shows the level of pressure on water resources in OIC countries in comparison with other country groups.

FIGURE 2.5
Pressure on Water Resources

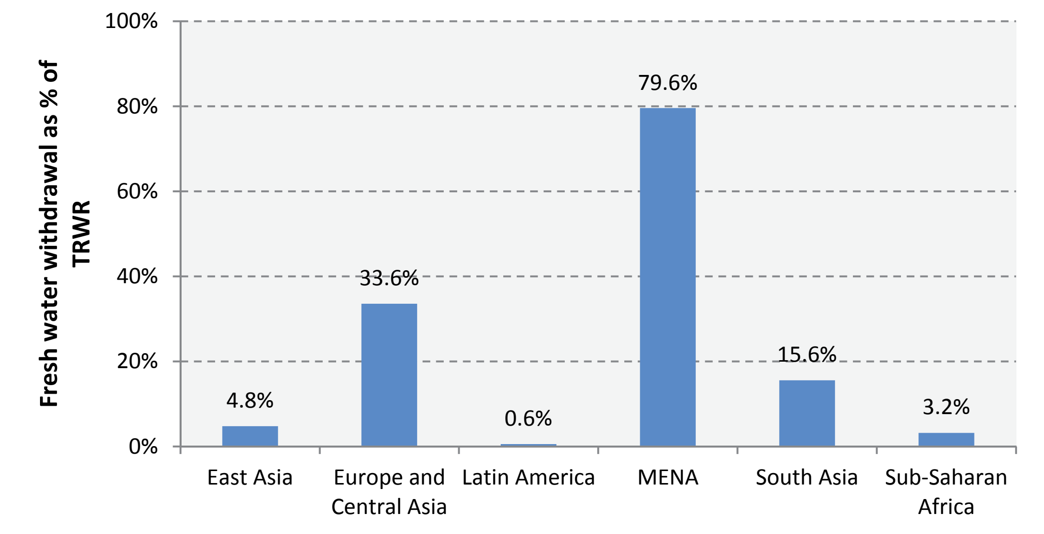


Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 2000-2014 was used for the calculations.*

The pressure on water resources in OIC countries far exceeds all other country groups. In OIC countries, fresh water withdrawal as a percentage of total renewable water resources is 12.2% compared to 5.3% in non-OIC developing countries and 9.0% in developed countries. As expected, the highest pressure on water resources is observed in OIC countries located in the arid and dry region of the Middle East and North Africa, where fresh water withdrawal as a percentage of total renewable water resources reached an alarming value of 79.6% (Figure 2.6). Next in line are OIC countries in Europe and Central Asia with pressure on water resources recorded at 33.6% and OIC countries in South Asia with 15.6%. On the other hand, OIC countries in Latin America, Sub-Saharan

Africa and East Asia recorded low pressure levels on water resources of 0.6%, 3.2% and 4.8%, respectively.

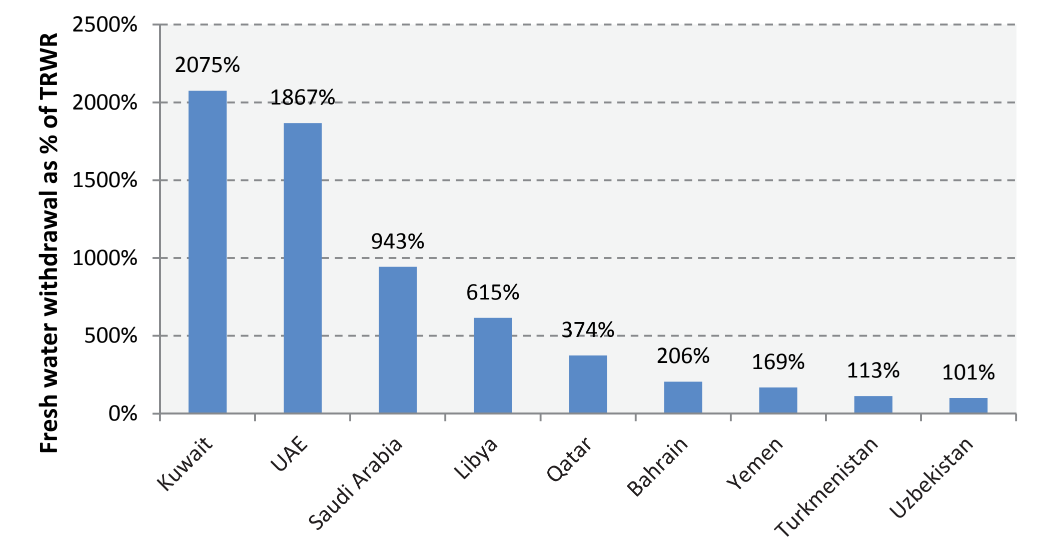
FIGURE 2.6
Pressure on Water Resources in OIC Regions



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Latest available data for 2000-2014 was used for the calculations.*

As shown in Figure 2.7, fresh water withdrawals in nine OIC countries exceed their total renewable water resources. All of these countries are located in either the Middle East and North Africa region or in the Central Asia Region.

FIGURE 2.7
OIC Countries with Pressure on Water Resources Exceeding 100%



Source: *FAO AQUASTAT Online Database. Latest available data between 2000-2014.*

The highest pressure on water resources is observed in Kuwait where fresh water withdrawal exceeds more than 20 times the amount of total renewable water resources in the country. Kuwait is followed by the United Arab Emirates where fresh water withdrawal as a percentage of total renewable water resources is a whopping 1867% and Saudi Arabia 943%.

2.4. Managing Water Demand

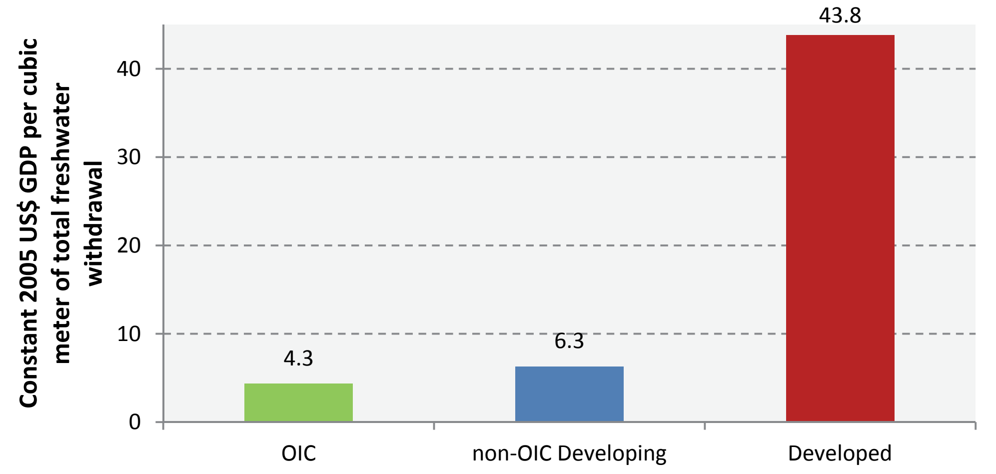
Generally speaking, strategies for managing water demand are based on four pillars which are:

- Reducing water demand;
- Reducing water losses;
- Increasing water productivity; and
- Water re-allocation.

Since the subject of managing water demand is a wide subject, covering it comprehensively is beyond the scope of this section. Thus the focus will be on the issue of increasing water productivity. In this context, two vital and interrelated activities that are of great importance to the issue of managing water demand are highlighted, namely the improvement in technical efficiency of water use and the efficient allocation of available water among competing uses. Improvements in the efficiency of water use and its allocation are usually undertaken by water providers and water users with the different water using sectors, namely: agriculture, industrial and municipal. By meeting the needs of water users using less water, significant quantities of water can be freed up.

As illustrated in Figure 2.8, water productivity is very low in OIC countries compared to other country groups where each one cubic meter of total freshwater withdrawal corresponds to 4.3US$ of GDP. This compares poorly with water productivity in non-OIC developing countries where GDP per cubic meter of total freshwater withdrawal equals 6.3 US$, and is astronomically behind the level of 43.8 US$ recorded in the developed countries.

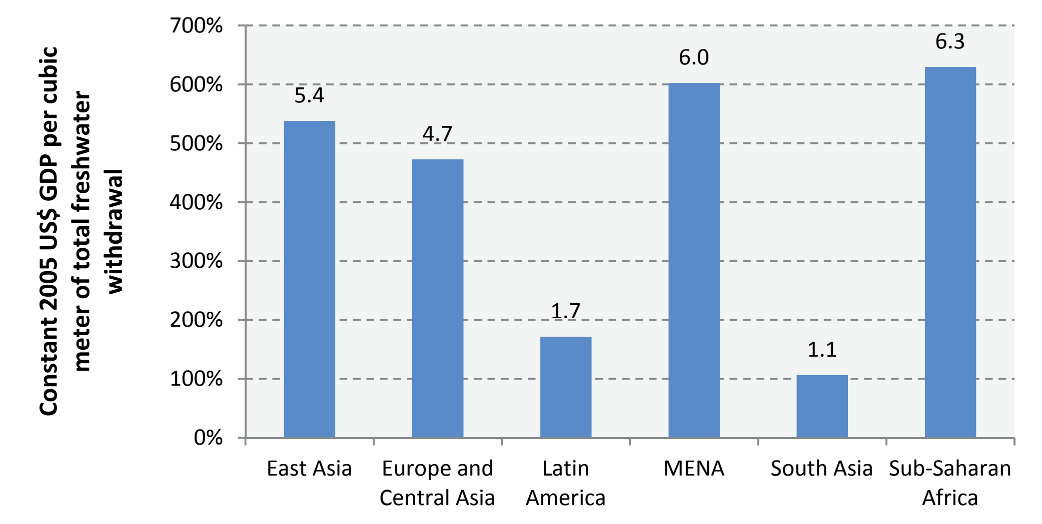
FIGURE 2.8
Water Productivity, 2013



Source: *SESRIC Staff Calculations based on World Bank WDI Online Database. Data weighted by country GDP and Fresh Water Withdrawals. Data available for 167 countries of which 53 are OIC member states*

A significant level of variability among OIC regions has been observed in terms of water productivity. As Figure 2.9 shows, OIC countries in Sub-Saharan Africa recorded the highest water productivity among OIC regions, followed by OIC countries in the Middle East and North Africa, and OIC countries in East Asia. In Contrast, OIC countries in South Asia recorded the lowest water productivity among OIC regions followed by OIC countries in Latin America and OIC countries in Europe and Central Asia.

FIGURE 2.9
Water Productivity in OIC Regions, 2013



Source: *SESRIC Staff Calculations based on World Bank WDI Online Database. Data weighted by country GDP and Fresh Water Withdrawals. Data available for 53 OIC member states*

The state of affairs indicates that OIC countries have a large opportunity to improve their water productivity through, inter alia, increasing the technical efficiency of water use and efficiently allocating available water among competing uses.

3. Water Scarcity

A famous Arabic sayings states that: "Water is the most unappreciated when available and the dearest when absent."[2] Indeed water scarcity has many implications ranging from the social to the economical, but the implications do not stop here, and few resources on planet earth carry more vital implications for human security than water. Water scarcity is among the main challenges to be faced by many countries around the World in the 21st century. Water use has been growing at more than twice the rate of population increase in the last century, and, although there is no global water scarcity as such, an increasing number of regions are chronically short of water (FAO, 2007). This shows that water scarcity is not only a manifestation of demographic pressures, but that the rate of economic development, urbanization and pollution are all putting enormous pressure on water resources.

3.1. Understanding Water Scarcity

Human demand for water is in continuous increase. The increase in water demand does not stem from a single sector, but extends to all water using sectors, namely: agriculture, industrial, and municipal. The end result is unsatisfied demand leading to competition between water users, disputes, depletion of water resources and harm to the environment.

---

[2] الماء أهون موجود و أعز مفقود. و يروى عن الْأَصْمَعِيَّ أنه قال: قَالَ سَلْمُ بْنُ قُتَيْبَةَ لِلشَّعْبِيِّ : مَا تَشْتَهِي ؟ قَالَ : أَشْتَهِي أَعَزَّ مَفْقُودٍ وَأَهْوَنَ مَوْجُودٍ . فَقَالَ : يَا غُلَامُ ! اسْقِهِ الْمَاءَ "

There is no single all encamping definition of water scarcity with the literature containing tens of different definition of water scarcity. Among all of these definitions, The World Water Development Report (UN-Water, 2006) stands out as the most suitable for the discussions presented in this report. According to this report water scarcity is defined as: "The point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangements to the extent that the demand by all sectors, including the environment, cannot be satisfied fully [...], a relative concept [that] can occur at any level of supply or demand. Scarcity may be a social construct (a product of affluence, expectations and customary behaviour) or the consequence of altered supply patterns stemming from climate change. Scarcity has various causes, most of which are capable of being remedied or alleviated". The suitability of this definition for the purpose of this report lays in the fact that it addresses both water availability and water demand and recognizes that water scarcity is not just a product of natural factors, but also of human factors too, which indicates that the issue of water scarcity can be managed and alleviated.

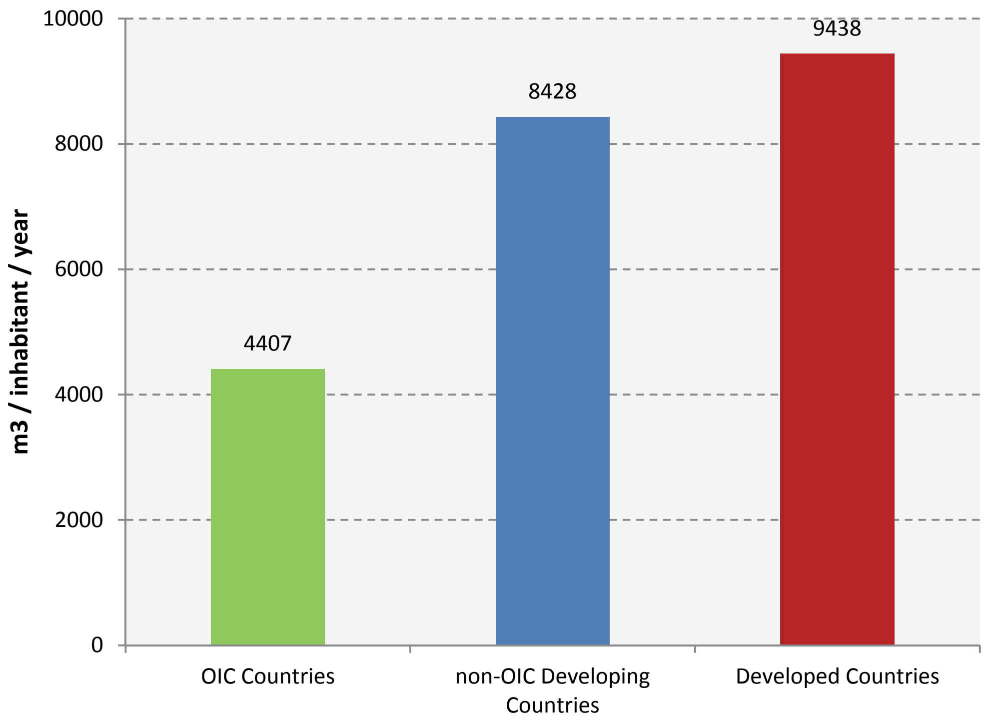
Water scarcity has many dimensions and can be classified differently according to those dimensions. For example; The Comprehensive Assessment of Water Management in Agriculture (CA, 2007) distinguishes two main types of water scarcity, namely physical scarcity and economic scarcity. Physical scarcity is said to occur when there is not enough water to meet all demands, including environmental flows. Symptoms of physical water scarcity are severe environmental degradation, declining groundwater, and water allocations that favour some groups over others. Economic water scarcity is described as a situation caused by a lack of investment in water or a lack of human capacity to satisfy the demand for water. Symptoms of economic water scarcity include scant infrastructure development, either small or large-scale, so that people have trouble getting enough water for agriculture or drinking. Also, the distribution of water may be inequitable, even where infrastructure exists. Much of sub-Saharan Africa is characterized by economic scarcity, so further water development could do much to reduce poverty.

There are many active discussions on how to measure water scarcity. The most widely used indicator of water scarcity is the total renewable water resources (TRWR) per capita. Based on this indicator, the threshold values of 500, 1,000 and 1,700 m^3/inhabitant/year are used to distinguish between different levels of water scarcity (Falkenmark and Widstrand, 1992). Total annual renewable water resources that are less than 500m^3 per capita indicate *absolute water scarcity*. Values between 500 and 1000 signify *chronic water shortages*. Values between 1,000 and 1,700 point to *regular water stress*; whereas, values large than 1,700 indicate *Occasional or local water stress*.

3.2. Current State of Water Scarcity

Figure 3.1 shows annual total renewable water resources per capita for OIC countries in comparison with other country groups. As groups, none suffers from water scarcity where annual total water resources per capita in all country groups exceed 1,700m^3. Nonetheless, as will be shown later in this section, many regions and countries suffer from water scarcity. Among the country groups shown in Figure 3.1, the group of OIC countries is the closest to the water scarcity thresholds. OIC countries recorded an average value of 4,407m^3 of total renewable water resources per inhabitant per year, a rate which is significantly lower than that observed in non-OIC developing countries (8,428m^3 per inhabitant per year) and developed countries (9,438m^3 per inhabitant per year).

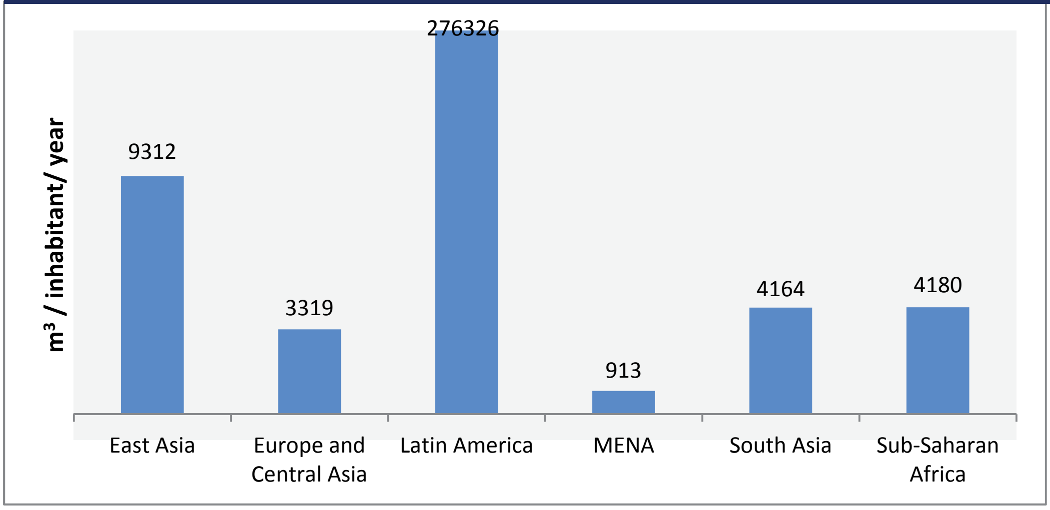
FIGURE 3.1
Water Scarcity (TRWR per capita), 2014



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations.*

At the OIC regional level, water scarcity is a fact of life in the arid and dry region of the Middle East and North Africa. As shown in Figure 3.2, OIC countries in this region have average annual total renewable water resources that stand at 913m^3 per capita, a rate which is below the threshold of 1,000m^3, and this puts them among the countries facing chronic water shortages. OIC countries in Europe and Central Asia, OIC countries in South Asia, and OIC countries in Sub-Saharan Africa all have limited average annual total renewable water resources per capita recorded, respectively, at 3,319m3, 4,164m^3 and 4,180m^3. On the other hand, OIC countries in Latin America are endowed by an abundance of water resources. The average annual total renewable water resource per capita in these countries is measured at 276,326m^3. Next in line are OIC countries in East Asia with average annual total renewable water resources per capita of 9,312m^3.

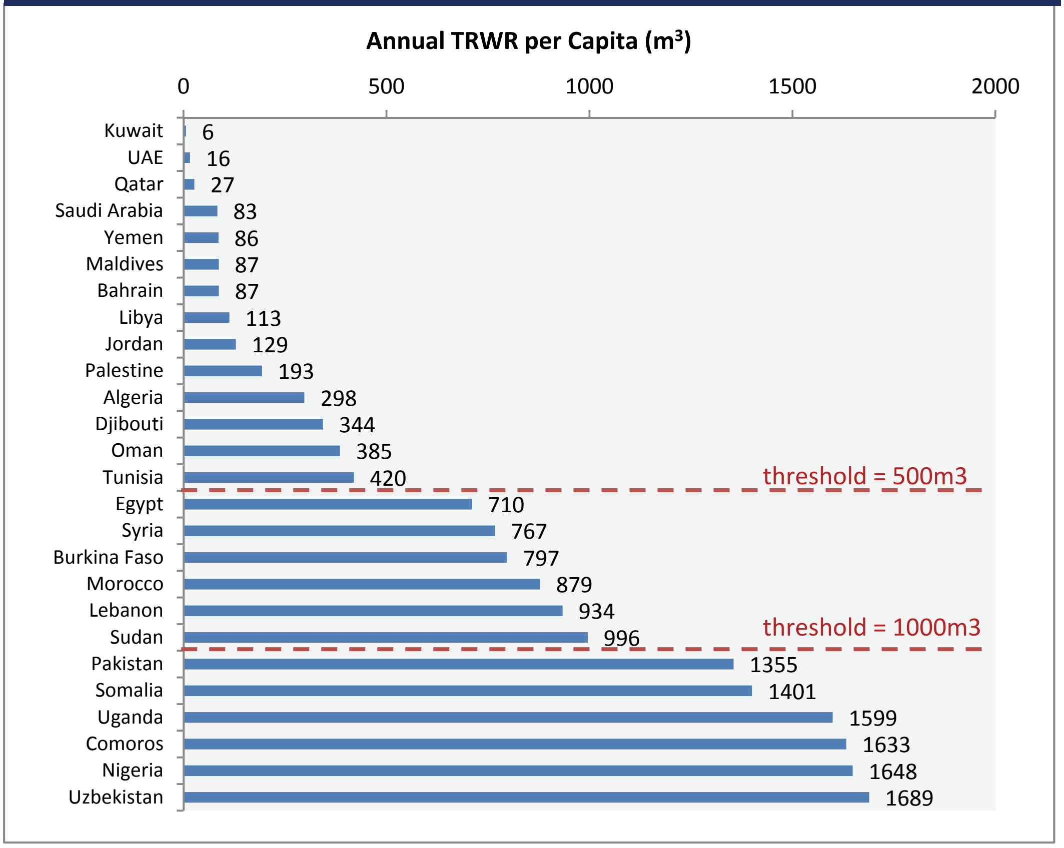
FIGURE 3.2
Water Scarcity (TRWR per capita) in OIC Regions, 2014



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Data weighted by country populations. Graph not drawn not to scale.*

At the individual country level, the issue of water scarcity is bleak with many OIC countries suffering from different levels of water scarcity. As Figure 3.3 reveals, almost half of OIC countries face some level of water scarcity.

FIGURE 3.3
OIC Countries Suffering from Water Scarcity, 2014



Source: *FAO AQUASTAT Online Database. Latest available data between 2000 and 2014.*

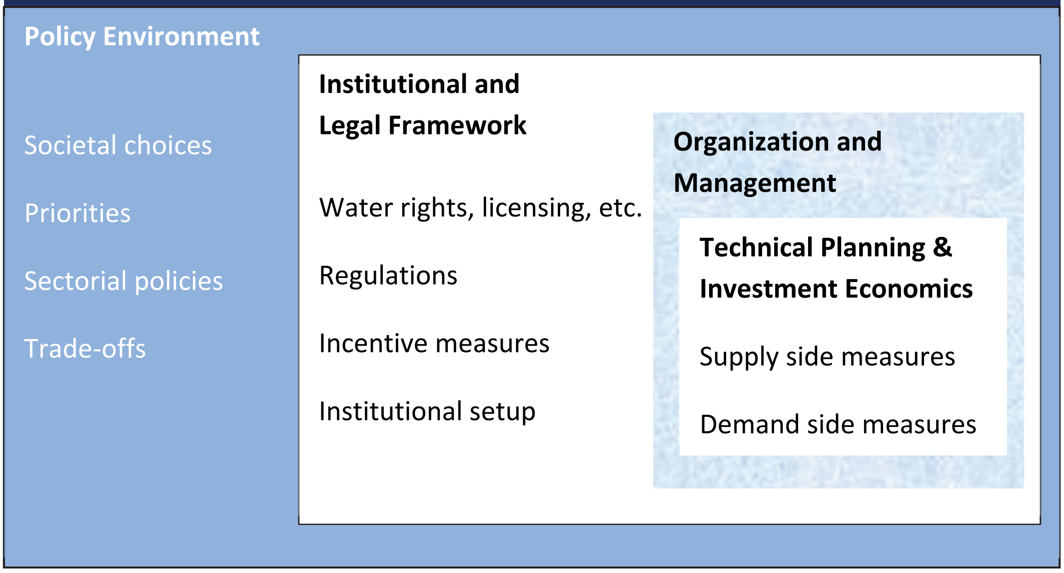
Absolute water scarcity is observed in 14 OIC countries, namely Kuwait, United Arab Emirates, Qatar, Saudi Arabia, Yemen, Maldives, Bahrain, Libya, Jordan, Palestine, Algeria, Djibouti, Oman and Tunisia. Chronic water shortages are observed in six OIC countries, namely Egypt, Syria, Burkina Faso, Morocco, Lebanon and Sudan. Finally, six OIC countries experience regular water stress, namely Pakistan, Somalia, Uganda, Comoros, Nigeria and Uzbekistan.

3.3. Coping with Water Scarcity

The growth in global population coupled with the increased demand for water in the agriculture, industrial, and municipal sectors lead many to believe that a “water crisis” is inevitable. However, nothing can be further from the truth and the presumed “water crisis” can be mitigated by adjusting the way in which water is managed and governed (Moriarity et al., 2004)

To cope with water scarcity most frameworks adopt a step-wise approach. For example Keller (2000) proposed a three phased approach: exploitation, conservation, and augmentation. Molden et al., proposed a different step-wise approach: development, utilization, and allocation. These step-wise approaches tend to focus on economic considerations and social responses and adaptations to water scarcity. However, Molle (2003) argues that responses to water scarcity are not driven solely by economic considerations or locally perceived needs, but result from the distribution of power among stakeholders, as well as their respective interests and strategies with regard to the different options available. Accordingly, he proposed a more analytical approach in which policy responses to water scarcity are considered in a wider political economy framework. The above mentioned dimensions of water scarcity are captured in Figure 3.4 where the complex and broader environment in which decisions take place are considered.

FIGURE 3.4
Considering Water Scarcity Response Options within a Broader Policy Context



Source: *Adopted from FAO Water Reports: Coping with Water Scarcity (2008)*

As Figure 3.4 points out, the supply side and demand side measures are merely part of technical planning that is considered in the organisation and management context, which is determined by the institutional and legal framework, which in turn is considered within the broader policy environment.

The analytical framework developed by Molle (2003) highlights that water scarcity is perceived differently by the different stakeholders who develop coping strategies and implement policies and decisions in relation to their power and capacities. FAO (2008) emphasises that the different roles, attitudes and strategies of the various stakeholders involved in water policy and management need to be clearly understood. Table 3.1 shows the objectives of major groups of decisions makers at different levels and the strategies at their disposal to address water scarcity

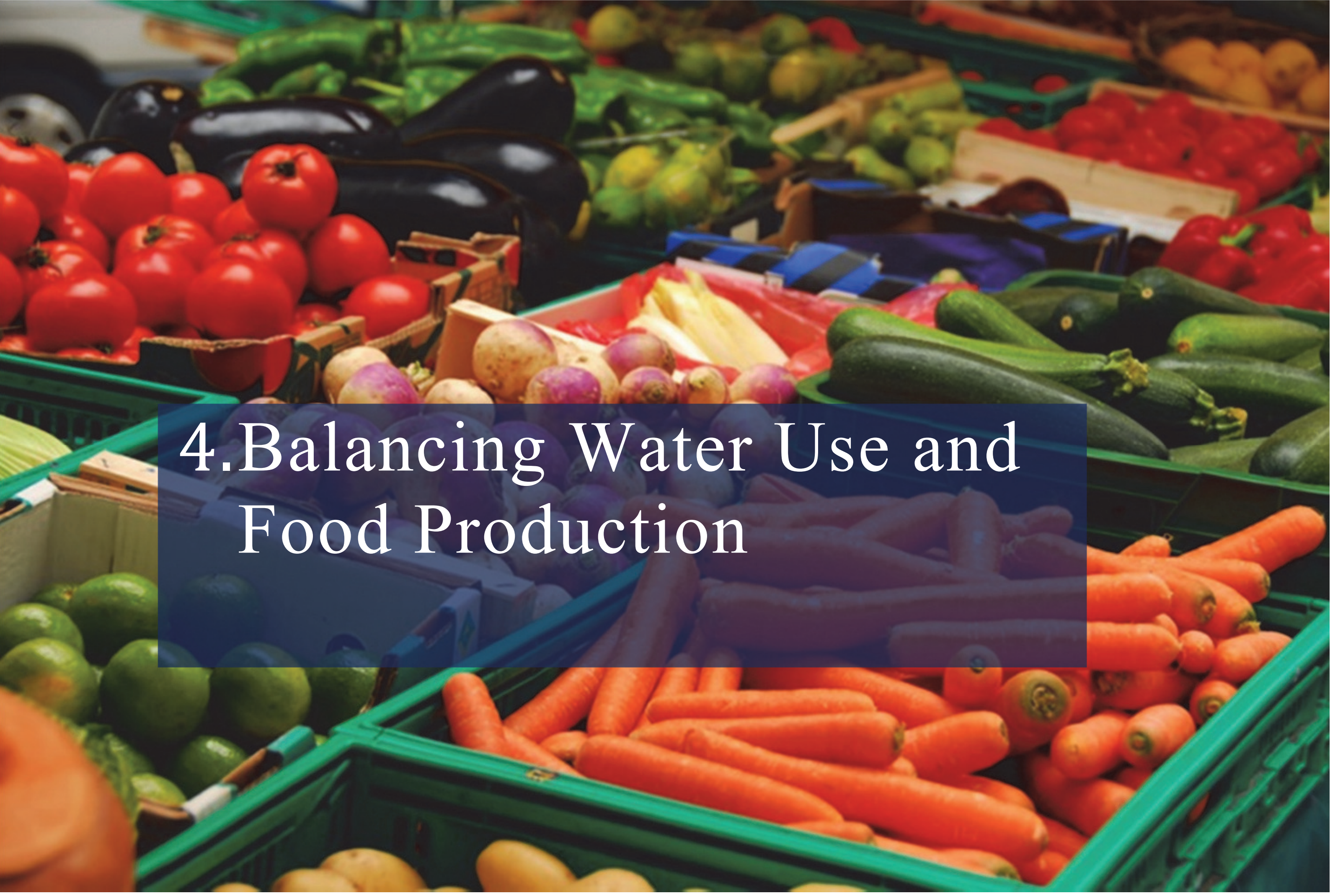
TABLE 3.1
Strategies and Polices for Coping with Water Scarcity According to Categories of Decision Makers

Level	Supply Side	Demand Side
WHAT: OBJECTIVE		
National water authority	Providing safe and sufficient water to all sectors of the economy while maintaining the integrity of the resource base	Ensuring efficient and sustainable use of freshwater
National authority for agriculture and irrigation	Securing sufficient water supply to satisfy the needs of the agriculture sector	Ensuring highest productivity of water used in agriculture
River basin or aquifer authority	Ensuring that available supply of water is provided to all users in a transparent, reliable and effective way	Ensuring efficient and sustainable use of freshwater by all users at river basin or aquifer level, avoiding conflicts and ensuring environmental protection
Irrigation scheme manager; Water User Association	Ensuring that a sufficient supply of water is provided to all users in a reliable, timely and effective manner	Ensuring that available water is used in the most productive way
Farmers	Securing supply of water for all farm operations	Using available water most productively and profitably
HOW: STRATEGIES & POLICES		
National water authority	Construction of multi-purpose dams, desalination plants, inter-basin transfer, Pollution control, negotiation of trans-boundary allocations; establishment and enforcement of environmental flows	Adaption of water laws; development of water institutions; tighter enforcement; promotion of water markets; trade mechanisms; water charges or quota mechanisms; administration of water rights; water

		allocation and water quality standards; public awareness campaigns; buy-back for environmental purposes
National agriculture and irrigation authorities	Construction of irrigation dams; negotiation of water allocation to agriculture	Incentives for irrigation modernization; adoption of service-oriented management of irrigation; adaptation of irrigation infrastructure for increased flexibility and reliability of water supply; review of agricultural water tariff policy
River basin or aquifer authority	Construction of large dams, dam operation rules, aquifer recharge, well drilling (groundwater development)	Optimization of dam management; management of water allocation mechanisms; administration of groundwater use; pollution control
Irrigation scheme manager; Water User Associations	Negotiation of water allocation, recycling of drainage water; collective land improvements, on-scheme storage development and management	Reducing losses in distribution; incentives for increased economic efficiency of field-level water use (subsidies, volumetric pricing, water markets)
Farmers	Individual well drilling; re-use of drainage water; on-farm water conservation investments; on-farm water storage; trading water; scavenging water; collective action	On-farm efficiency improvement (pressurized irrigation), deficit irrigation, adaptation of crops and crop varieties to water supply conditions

Source: *Adopted from FAO Water Reports: Coping with Water Scarcity (2008)*

In this context, OIC countries are advised not to limit their responses to water scarcity to technical solutions, but to consider the issue within the wider policy environment, including the institutional and legal frameworks. Also, in OIC countries, the different roles, responsibilities, authorities, needs and strategies of the various stakeholders involved in water policy and management need to be clearly defined and the effective linkages between the various stakeholders to be established.



4.Balancing Water Use and Food Production

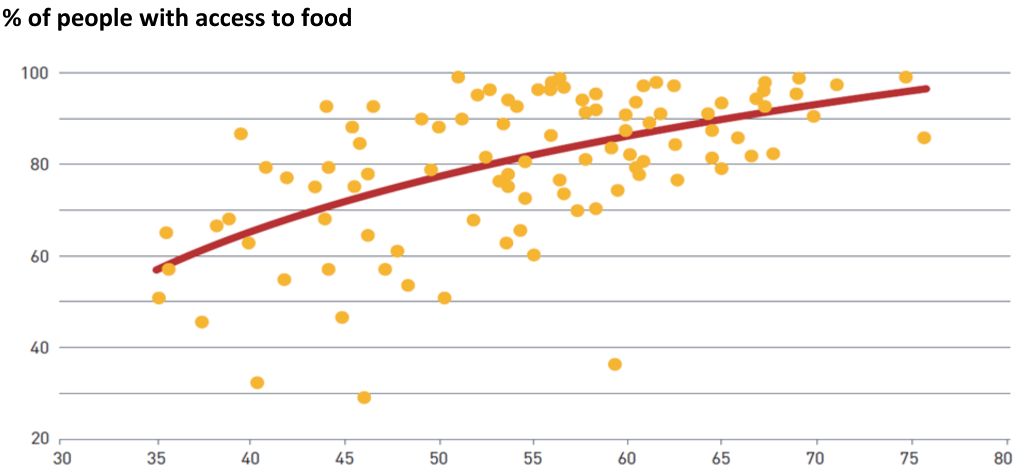
One of the major issues that is relevant to human and economic development is how to manage water resources to meet the rising demand for food while at the same time meeting the demand from industrial and municipal use. This chapter examines the linkages between water and food security and highlights the issue of competition for water resources among different water using sectors before concluding with the topic of irrigation in agriculture.

4.1. Linkages between Water and Food Security

SESRIC projections indicate that OIC countries population will increase from an estimated 1.71 billion in 2015 to an estimated 2.18 billion in 2030 (*SESRIC staff calculations based on UN Population Division Estimates and Projections*). The increase in population coupled with economic progress will translate in increased demand for food. Yet, as it has been shown earlier in this report, water resources which are the base of food production are limited and already under pressure in many OIC countries. Thus, ensuring access to water, especially, for the agriculture sector is of paramount importance to food security.

If water is the key to food security then its absence is the cause of undernourishment and famine. As Figure 4.1 illustrates, the water index is positively correlated with the percentage of people with access to food; that is, as the water index increase, the percentage of people with access to food increases, and vice versa, as the water index decrease a lower percentage of people gain access to food.

FIGURE 4.1
Access to Water & Food Security (developing countries and countries in transition)

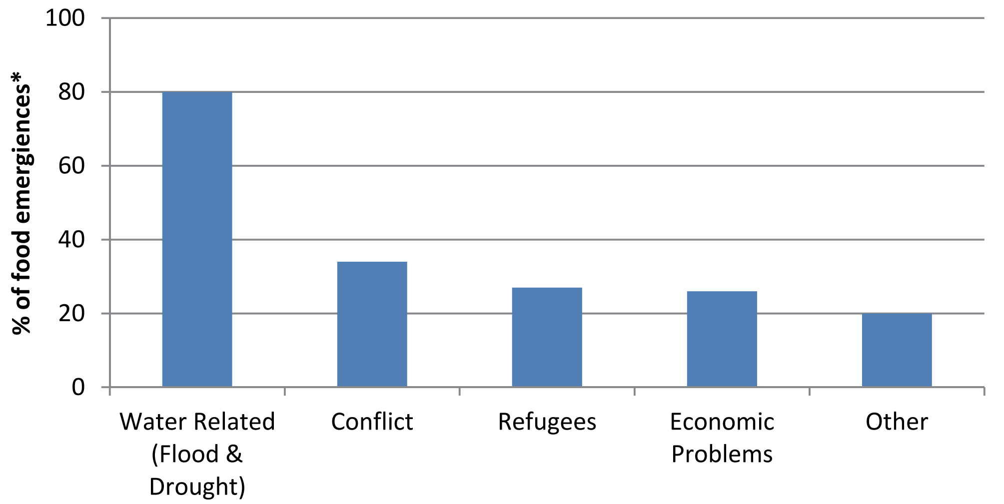


**A composited indicator that incorporates measures of water resources (from rainfall, river flows and aquifer recharge), access, environmental issues (water quality) and pressure on resources*

Source: *Adopted from FAO, CEH Wallingford*

Water is also linked to food security from another dimension which is food emergencies. As Figure 4.2 illustrates, water related events outstrips conflict, refugees and economic problems as the cause of food emergencies in developing countries. Erratic rainfall and sessional variability in water availability result in floods and droughts, which lead to the most severe incidents of food emergencies.

FIGURE 4.2
Causes of Food Emergences in Developing Countries, 2002



**Total exceed 100% because multiple causes are cited for many emergencies*

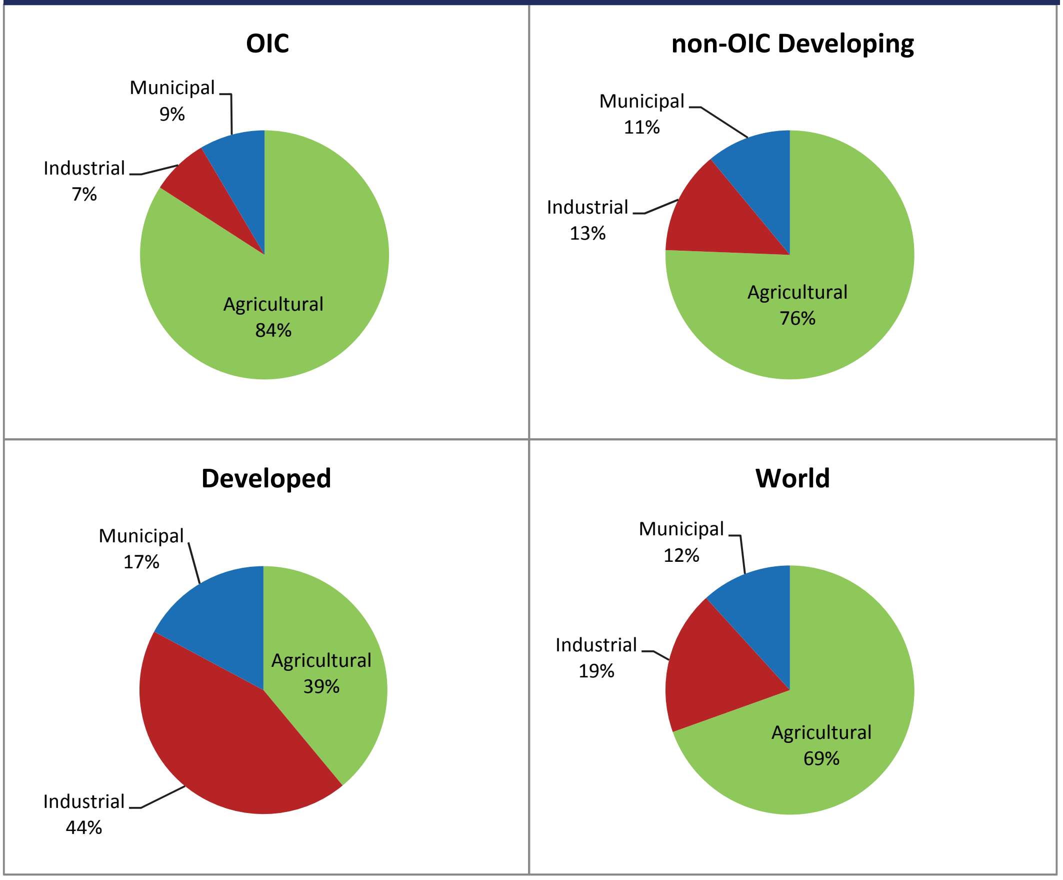
Source: *Adopted from FAO, Water at a glance: The relationship between water, agriculture, food security and poverty*

4.2. Competing Usages for Water

As OIC countries undergo urbanizing, more demand for water will come from municipal and industrial use. Meeting the demand for water from municipal and industrial use is vital for OIC countries to achieve their development goals; however it carries the threat of diverting water resources from agricultural with all the negative and dangerous implications it has for food security. Furthermore, many poor and malnourished people still live in rural areas in OIC countries and depend on agriculture for income, employment and food. The fast pace of urbanization resulting in the increased use of water for municipal and industrial use threatens to reduce their access to water thus damaging their livelihoods.

As Figure 4.3 shows, globally, agriculture is the biggest user of water accounting for 69% of all water withdrawals.

FIGURE 4.3
Water Withdrawal by Sector

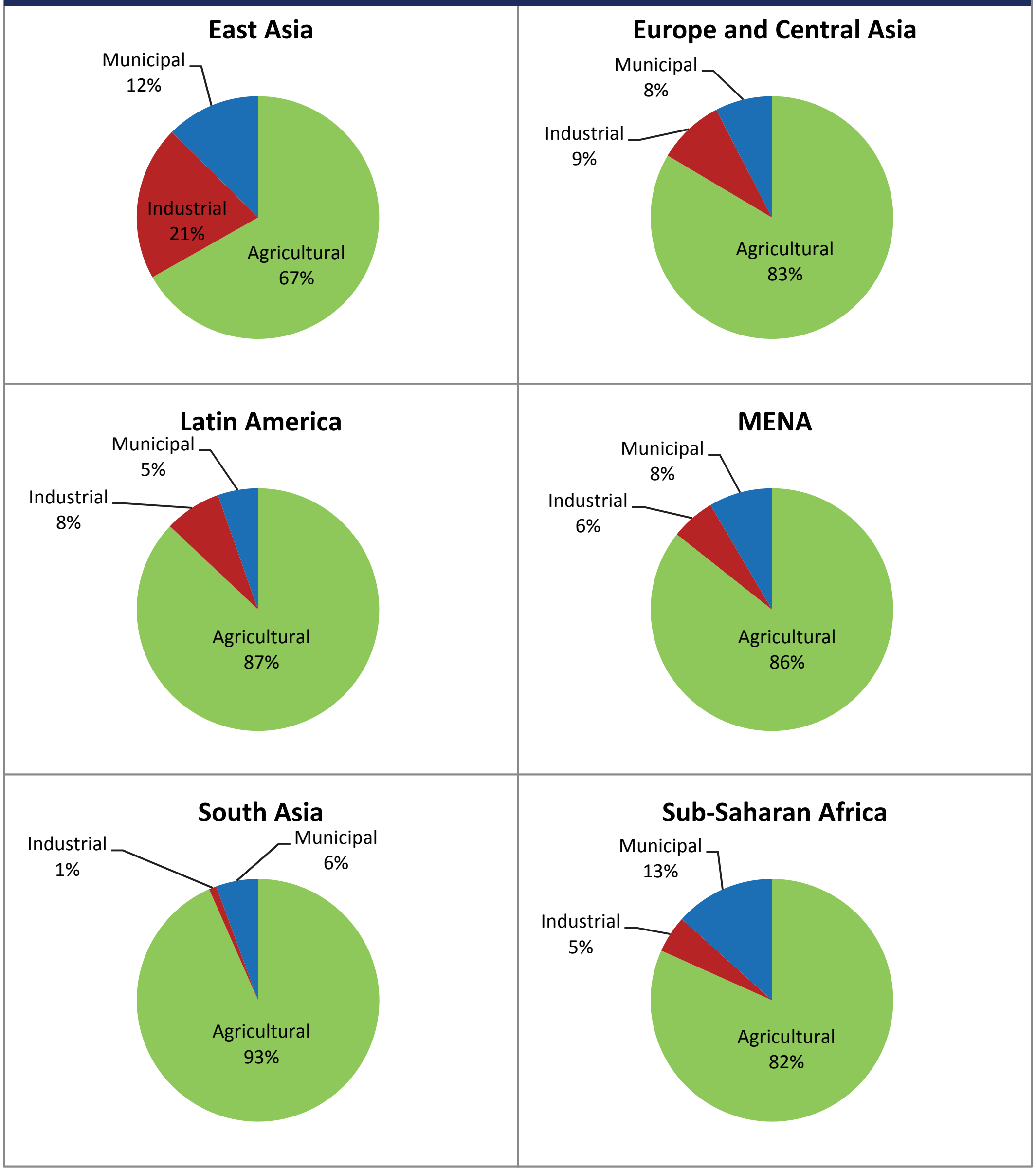


Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Latest available data for 2000-2014 were used in the calculations.*

Agricultural water use in OIC countries which accounts for 84% of all water withdrawal exceeds that observed in non-OIC developing countries (76%) and developed countries (39%). In OIC countries, municipal water use which accounts for 9% of all water withdrawal exceeds that of industrial water use which accounts for 7% of all water withdrawal. This is in direct contrast with what is observed in non-OIC developing countries, developed countries and the world, where industrial water use surpasses that of municipal water use.

At the OIC regional level, the highest agricultural use of water is observed in OIC countries in South Asia, where it accounts for 93% of all water withdrawals (see Figure 4.4). OIC countries in Latin America and OIC Countries in the Middle East and North Africa follow with agricultural water withdrawals accounting for 87% and 86% of all water withdrawals respectively. On the other hand, the lowest agricultural water use is observed in OIC countries in East Asia, followed by OIC countries in Sub-Saharan Africa and OIC countries in Europe and Central Asia, where it accounts for 67%, 82%, and 83% of all water withdrawal respectively.

FIGURE 4.4
Water Withdrawal by Sector in OIC Regions



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Latest available data for 2000-2014 were used in the calculations.*

Although at the OIC aggregate level, municipal water use exceeds that of industrial water use, at the OIC regional level the picture is quite different. In half of the OIC regions, agricultural water use exceeds that of municipal water use, namely in, OIC countries in the Middle East and North Africa, OIC countries in South Asia, and in OIC countries in Sub-Saharan Africa. In the other half of OIC regions, industrial water use exceeds that of municipal water use, specifically in, OIC countries in East Asia, OIC countries in Europe and Central Asia, and OIC countries in Latin America.

The highest level of industrial water use as a percentage of total use is observed in OIC countries in East Asia (21%) followed by OIC countries in Europe and Central Asia (9%), and OIC countries in Latin America (8%). When it comes to municipal water use, the highest level of use as a percentage of total is observed in OIC countries in Sub-Saharan Africa (13%), followed by OIC countries in East Asia (12%) and OIC Countries in Europe and Central Asia and OIC countries in the Middle East and North Africa (both 8%).

4.3. Irrigation

The use of water in food production varies widely, reflecting environmental conditions (particularly water availability) as well as socio-economic conditions (including population density and institutional capacity). Whilst some countries are able to rely primarily on rain-fed irrigation for food production (e.g. Gabon, Gambia Sierra Leone, and Uganda), others need irrigation, with some developing sophisticated infrastructure such as: Algeria, Egypt, Libya, Syria, UAE (OIC Water Vision, 2012).

Irrigation can increase the yields of most crops significantly. The highest yields that can be obtained from irrigation are more than double the highest yields that can be obtained from rain-fed agriculture (FAO: Water at a Glance). Thus, irrigation holds the most potential for increasing food production and increasing food security. In spite of this fact, the area equipped for irrigation as a percentage of agricultural area in OIC countries is low when compared to non-OIC developing countries and the world average (see Table 4.1). The area equipped for irrigation as percentage of agricultural area in OIC countries stands at 5.3, compared to 7.3 and 6.1 for non-OIC developing countries and the world respectively. These figures indicate that OIC countries have a large room for improvement by increasing the percentage of areas that are irrigated.

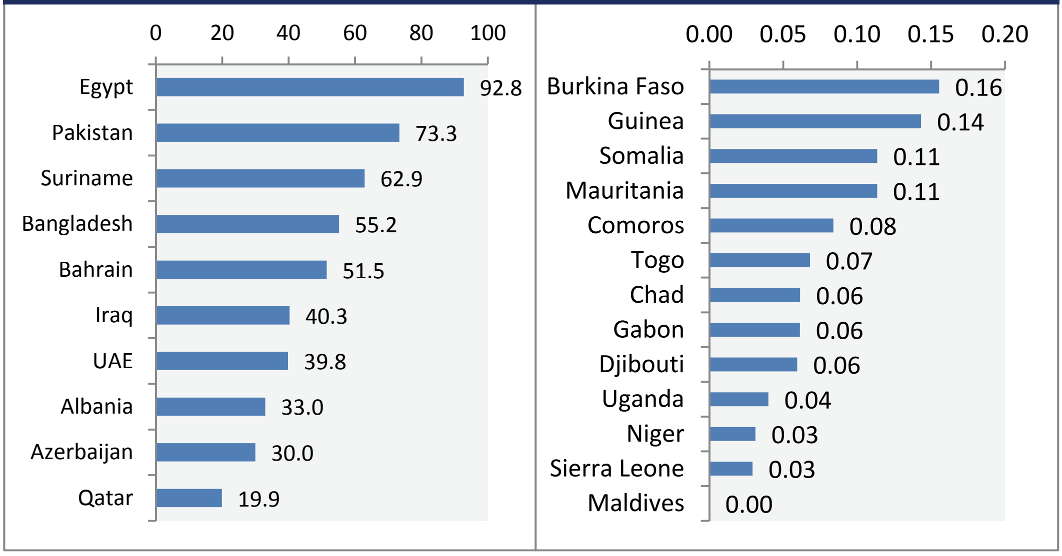
TABLE 4.1
Area Equipped for Irrigation, 2008-2013

	Area equipped for irrigation as percentage of Agricultural Area
OIC Countries	5.3
Other Developing Countries	7.3
World	6.1

Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database*

At the individual country level, the percentage of agricultural area that is irrigated varies widely among OIC countries, ranging from near zero levels to 92.8% as can be seen in Figure 4.5, which shows the percentage of the irrigated area in the countries' total agricultural area. Only nine OIC countries have percentages exceeding 20%, whereas, the percentage in 13 OIC countries is lower than 0.2%.

FIGURE 4.5
OIC Countries with the Highest (left) and Lowest (right) Area Equipped for Irrigation as % of Agricultural Area, 2008-2012



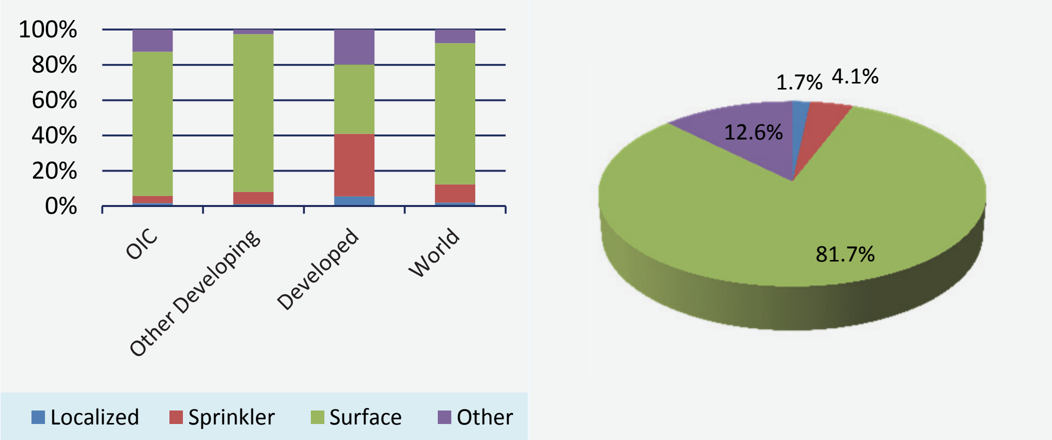
Source: *FAO AQUASTAT Online Database.*

The use of efficient irrigation systems and techniques has a crucial role in agricultural development and food production. In this regard, the available data on the irrigation techniques used in the OIC countries indicate that surface irrigation, which is the most traditional and most water-consuming technique, is by far the most widely used technique, practised in 82.1% of the total area equipped for irrigation, compared to other developing countries level of 89.3% (Figure 4.6, left). The ratio is more than 50% in 38 OIC countries. Consequently, huge amounts of the water diverted for irrigation in these countries are wasted at the farm level through either deep percolation or surface runoff.

In contrast, sprinkler irrigation is practised in 4.1% of the total area equipped for irrigation in the OIC countries (Figure 4.6, right). This technique which is more water-saving than surface irrigation, is practised in more than 25% of the irrigation area in only 4 OIC countries, namely, Côte d'Ivoire (75.4%), Saudi Arabia (59.4%), Benin (41.7%), and Lebanon (27.9%). Furthermore, the ratio is almost negligible (less than 0.1%) in 27 OIC countries.

On the other hand, localized irrigation technique, which is the most water-saving technique, is practised in only 1.7% of the total area equipped for irrigation in the OIC countries. Prevalence of this technique also varies across countries within the OIC region. United Arab Emirates and Jordan stand out with their remarkably high levels in use of this technique, reaching 86.3% and 81.2%, respectively. In addition to these two countries, the percentage is more than 10% in only 5 OIC countries, namely, Tunisia (16.9%), Kuwait (13.4%), Benin (12.4%), Bahrain (11.6%) and Qatar (10.9%). In contrast, the percentage is negligible in 34 OIC countries (less than 0.1%).

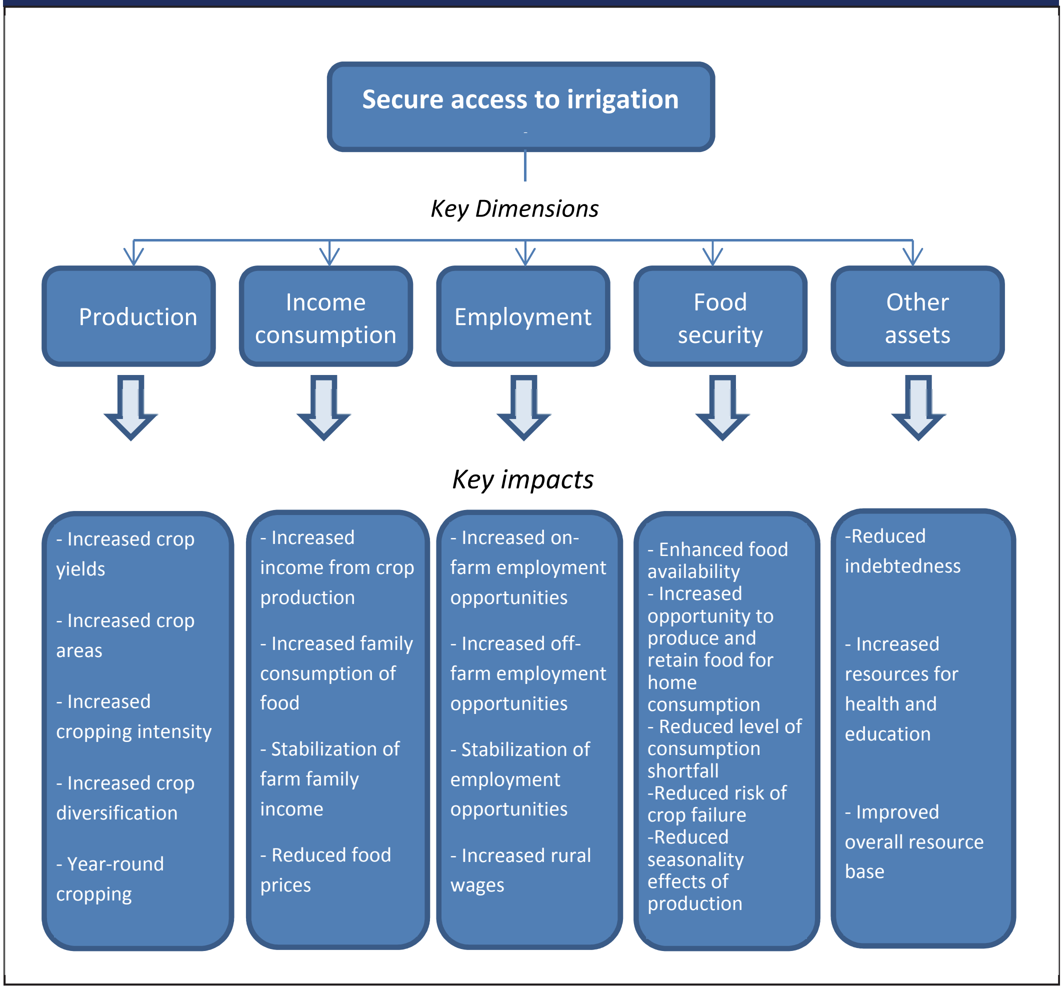
FIGURE 4.6
Irrigation Techniques as percentage of total area equipped for irrigation in the World (left) and in the OIC countries (right), 2008-2012



Source: *SESRIC Staff Calculations based on FAO AQUASTAT Online Database*

The benefits of irrigation go beyond that of food production to include many key dimensions as shown in Figure 4.7.

FIGURE 4.7
Access to irrigation water can reduce poverty and vulnerability



Source: *Adopted from Hussain and Hanjira 2003.*

As Figure 4.7 shows, Irrigation has positive effects on income consumption, employment, food security, and other assets. For this reason increasing access to irrigation can reduce poverty and vulnerability. If the increase of access to irrigation is accompanied with the use of water saving irrigation techniques such as localized irrigation, then all the positive effects mentioned above can be achieved while using minimal amount of water, thus increasing the low water productivity observed in OIC countries.

5. Access to Water and Sanitation Services

According to the OIC water Vision; adequate access to clean water and sanitation services is a central element of water security, and their importance to human health and productivity cannot be overstated. Within the OIC member states, water supply and sanitation service coverage ranges from very low to very high, with some nations providing universal access for all regions, while in other nations coverage is poor, and adequate household services limited to well-established urban areas. These differences largely reflect the variations in socio-economic conditions across the OIC (OIC Water Vision, 2012).

The OIC Water Vision identifies access to water and sanitation services as one of the major challenges which is still facing many OIC countries. This should not come as a surprise as access to water and sanitation services has a wide range of impacts ranging from health to the economy. Therefore, this chapter is devoted to the issues of access to water and sanitation services and their key impacts on sustainable development in OIC countries.

5.1. The Impact of Water and Sanitation Services on Sustainable Development

Our prophet **Muhammad** *"peace be upon him"* declares that: Muslims are partners in three things: water, pastures and fire[3]. By this, our prophet *"be peace upon him"* institutionalized a principle which is; all people should have access to water, access to water is a natural right to people and this access should not be denied.

Access to water is a basic human need. People need water to drink, cook, and for personnel hygiene. Also people need sanitation services that prevent contamination, diseases and that do not compromise dignity. So, it should come naturally, that access to

[3] يقول الرسول صلى الله عليه وسلم :المسلمون شركاء في ثلاث: الماء والكلأ والنار. رواه الإمام أحمد وغيره

water and sanitation services is recognized as a human right and has long been a central aim of international development policies and targets (UNGA, 2010). For example; the Millennium Development Goals "MDGs" sought to "halve the proportion of the population without access to safe drinking water and basic sanitation" between 1990 and 2015.

The progress towards achieving the MDGs for water and sanitation has been mixed with the progress towards ensuring access to safe drinking water registering higher success than ensuring access to sanitation services (see Table 5.1). Although the progress made towards the MDGs for water and sanitation is undeniable, it has been uneven with sharp geographic, social and economic inequalities in access persistent.

TABLE 5.1
Progress towards the MDGs for water and Sanitation, 2014

	Drinking Water	Sanitation	Drinking Water and Sanitation
Met Target	116	77	56
On track to meet target	31	29	30
Progress insufficient	5	10	-
Not on track to meet target	40	69	20

Source: *Adopted from WHO and UNICEF: Progress on Drinking Water and Sanitation, 2014 Update*

Providing access to water and sanitation services goes beyond meeting a basic human need to inducing positive effects on sustainable development. As Figure 5.1 illustrates the key impacts on sustainable development for providing access to water and sanitation services spans the domains of economy, environment and equity.

FIGURE 5.1
Schematic of Criteria for Sustainable Water, Sanitation and Hygiene Services and Their Key Impacts on Sustainable Development

Sustainable Development

Economy

Direct
- Reduced burden of collecting water when on premises
- Lower medical expenses
- Affordability including for the poor

Indirect
- Educated and healthy workforce
- Industry and commerce

Environment

Direct
- Reduced water wastage and avoiding overexploitation
- Adequate treatment of excreta and wastewater to protect the natural environment

Indirect
- Sustainable environmental services

Equity

Direct
- Disease prevention
- Dignity
- School attendance, especially for adolescent girls

Indirect
- Full participation in society
- Reduced poverty
- Gender equality

Underpinning Human Rights Water, Sanitation and Hygiene criteria:
Normative: Availability, safety, acceptability, accessibility and affordability
Cross-cutting: Non-discrimination, participation, accountability, impact and sustainability

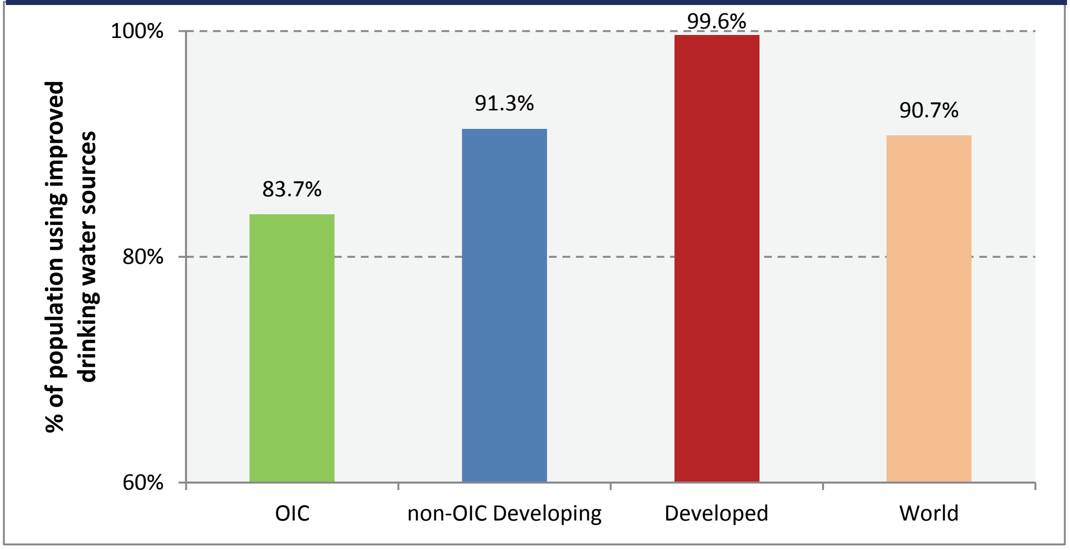
Source: *Adopted from Hussain and Hanjira 2003.*

Thus, it is important that expenditures on water and sanitation services are not viewed as a pure cost, but as an investment that results in substantial economic returns. In developing regions, the return on investment has been estimated at US$5 to US$28 per US dollar invested (WHO, 2012)

5.2. Access to Water

The MDG goal of halving the proportion of population without access to safe drinking water has been met. Whereas 76% of world population had access to improved drinking water sources[4] in 1990, the latest available figures indicate that almost 91 % of the world population have access to improved drinking water resources as shown in Figure 5.2.

FIGURE 5.2
Access to Improved Drinking Water Sources, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

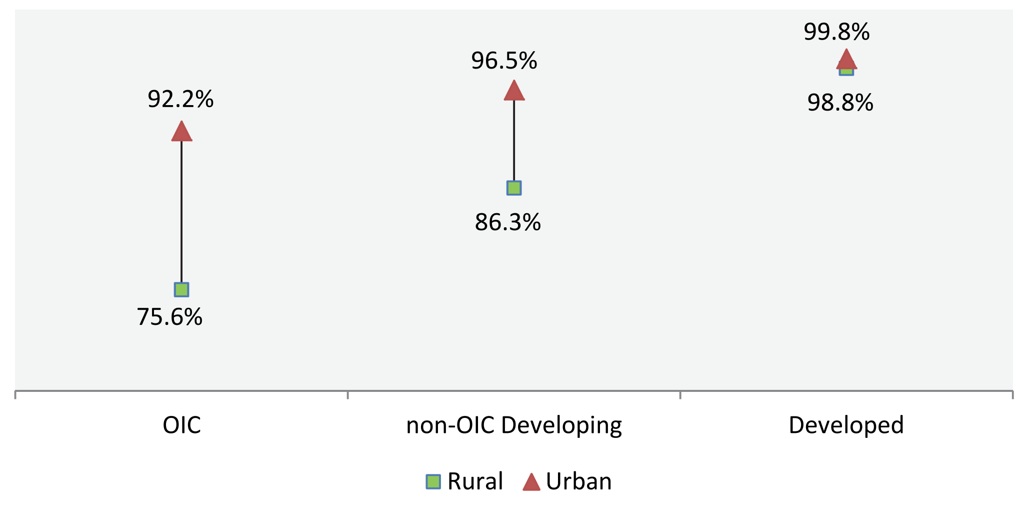
Figure 5.2 also reveals that the success of OIC countries in providing access to improved drinking water sources lags behind that of other country groups. While 83.7% of the population in OIC countries have access to improved water sources, the percentage is 91.3 in non-OIC developing countries and 99.6 in developed countries.

In developing countries, access to improved drinking water sources in rural and urban areas is lopsided with populations in urban setting enjoying higher rates of access as Figure 5.3 shows. The lopsided access to improved drinking water sources is highest in OIC countries where 92.2% of urban population have access to improved drinking water sources compared to 75.6% for rural population, a gap of 16.6%. In non-OIC developing countries, the disparity in access to improved drinking water resources is smaller but still

[4] An improved drinking water source, by nature of its construction and design, is likely to protect the source from outside contamination, in particular from faecal matter. Improved drinking water sources include: Piped water into dwelling, plot or yard - Public tap/stand pipe – Tube well/borehole - Protected dug well - Protected spring - Rainwater collection

significant (a gap of 10.2%) with 96.5% of urban population gaining access to improved drinking water sources compared with 86.3% for rural population. In contrast, in developed countries access to improved drinking water sources is almost universal with very marginal differences in access regardless of rural and urban settings.

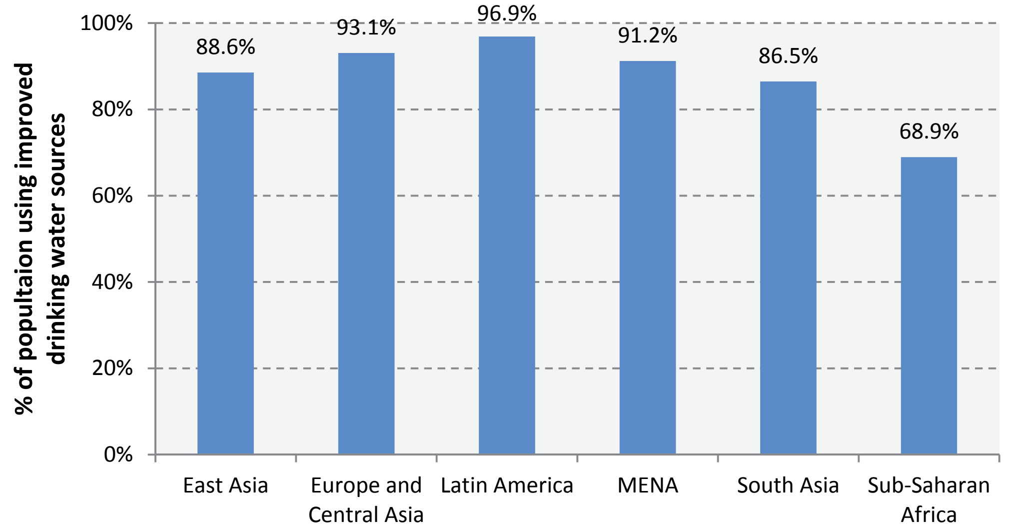
FIGURE 5.3
Disparities in Rural and Urban Access to Improved Drinking Water Sources, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water*

At the OIC regional level, access to improved drinking water source is not uniform (see Figure 5.4) The highest access rates to improved drinking water sources are observed in OIC countries in Latin America (96.9% of the population), followed by OIC countries in Europe and Central Asia (93.1% of the population) and OIC countries in the Middle East and North Africa (91.2% of the population).

FIGURE 5.4
Access to Improved Drinking Water Sources in OIC Regions, 2015



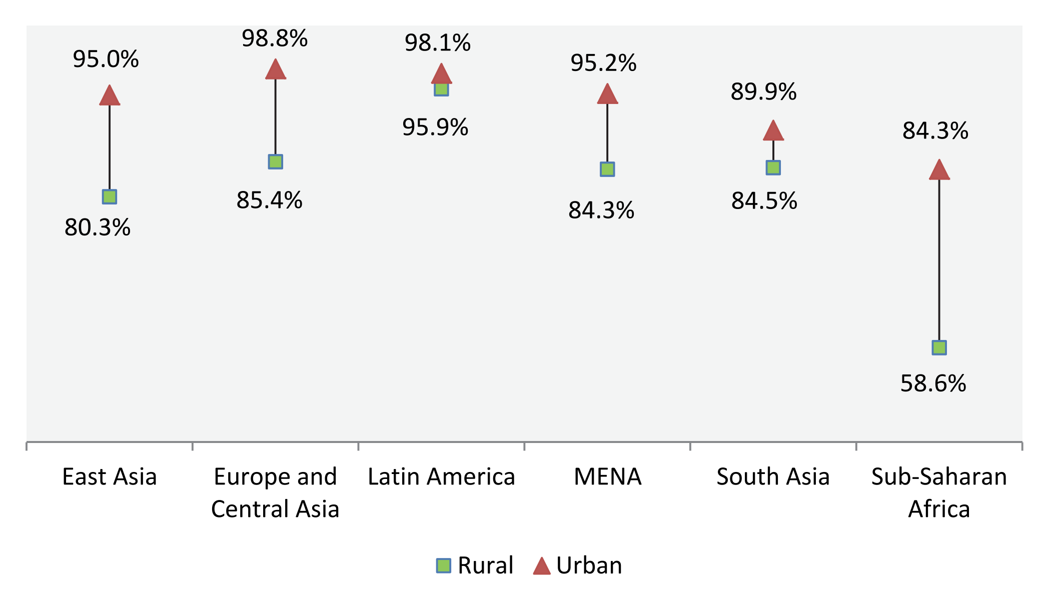
Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

On the opposite side, the lowest access rates to improved drinking water sources is observed in OIC countries Sub-Saharan Africa (68.9% of the population), followed by OIC countries in South Asia (86.5% of the population) and OIC countries in East Asia (88.6% of the population)

The greatest disparity in access to improved drinking water sources between rural and urban settings is observed in OIC countries in Sub-Saharan Africa where the gap is 25.7% (84.3% for urban population vs. 58.6% for rural population, see Figure 5.5) Next in line are OIC countries in East Asia where the gap is 14.7% and OIC countries in Europe and Central Asia where the gap is 13.4%.

OIC countries in Latin America register the lowest urban-rural disparity in access to improved drinking water sources with a small gap of 2.2%. In these countries 98.1% of the urban population have access to improved drinking water sources compared with 95.9% for rural population. OIC countries in Latin America are followed by OIC countries in South Asia where the urban-rural gap in access to improved drinking water sources is 5.4% and OIC countries in the Middle East and North Africa where the urban-rural gap in access to improved drinking water sources is 10.9%

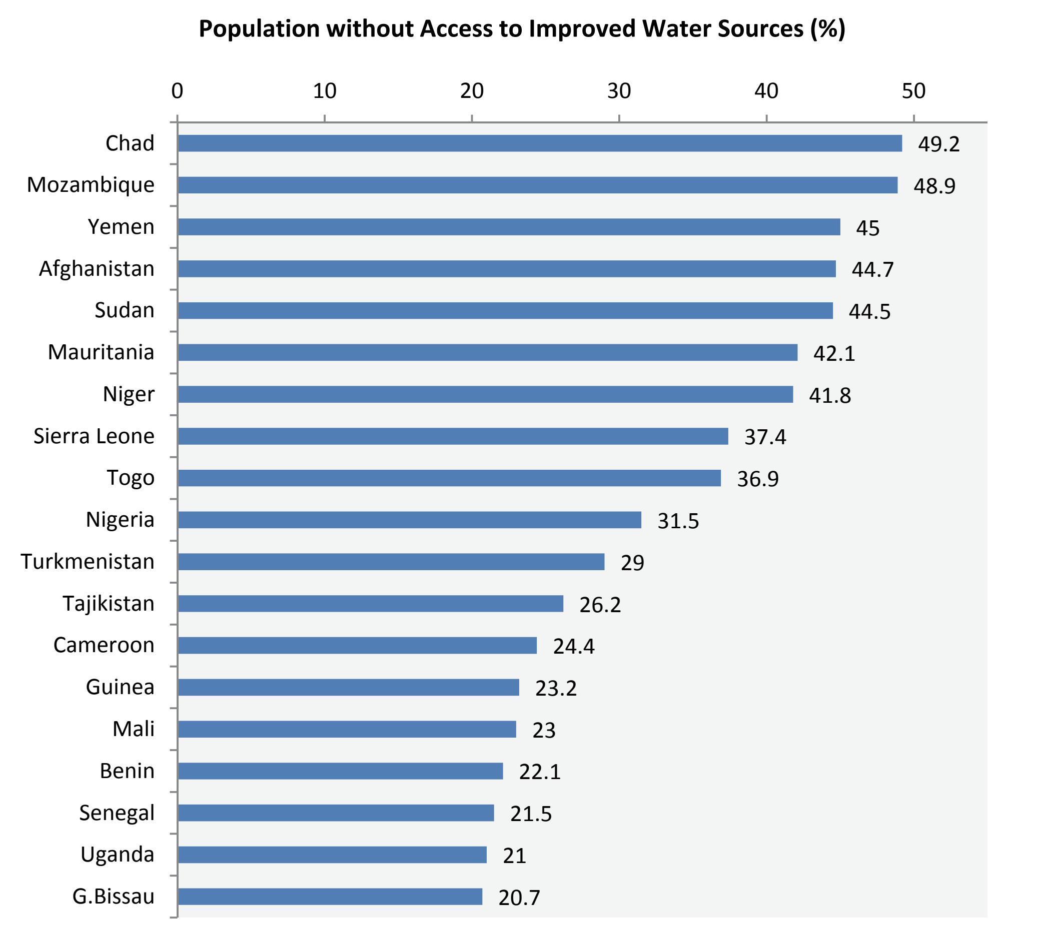
FIGURE 5.5
Disparities in Rural and Urban Access to Improved Drinking Water Sources, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water*

With all the progress made in improving access to water service, some OIC countries suffer from the fact that a significant proportion of their population still do not have access to improved drinking water sources. Case in point is Mozambique and Chad where almost half of the population is without access to improved drinking water sources. Furthermore, in 19 OIC countries the proportion of the population without access to improved drinking water sources exceeds 20%; these countries are shown in Figure 5.6

FIGURE 5.6
OIC Countries with Low Access Rates to Improved Drinking Water Resources, 2015



Source: *WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Data not available for 4 OIC countries which are: Brunei Darussalam, Libya, Somalia, and Palestine.*

5.3. Access to Sanitation Services

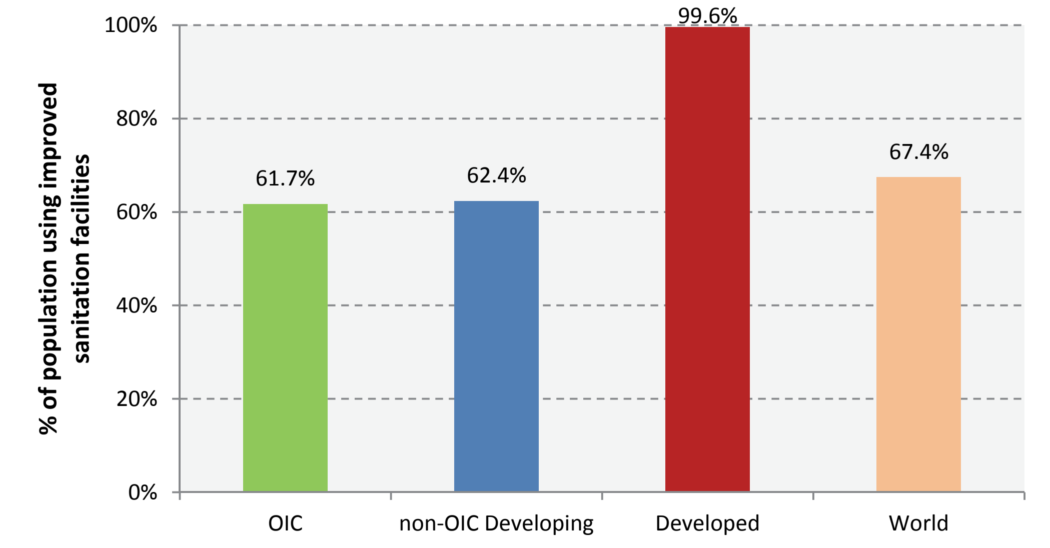
The MDG goal was to halve the proportion of population without access to improved sanitation facilities[5]; that is, to reduce it from 51% in 1990 to 25% in 2015. Although the proportion of population with improved sanitation facilities has increased from 49% in 1990 to 67.4% in 2015, the MDG goal for access to sanitation facilities has not been achieved since 32.6% of world population are still without access to improved sanitation facilities as illustrated in Figure 5.7

In OIC countries, 61.7% of the population have access to improved sanitation facilities. This percentage is slightly lower than that observed in non-OIC developing countries where 62.4% have access to improved sanitation facilities. Developed countries on the

[5] An improved sanitation facility is one that likely hygienically separates human excreta from human contact. Improved sanitation facilities include: Flush or pour flush to piped sewer system, septic tank or pit latrine - Ventilated improved pit latrine - Pit latrine with slab - Composting toilet

other hand have universal access to improved sanitation facilities (99.6% of population), thus helping to push the world average to 67.4%

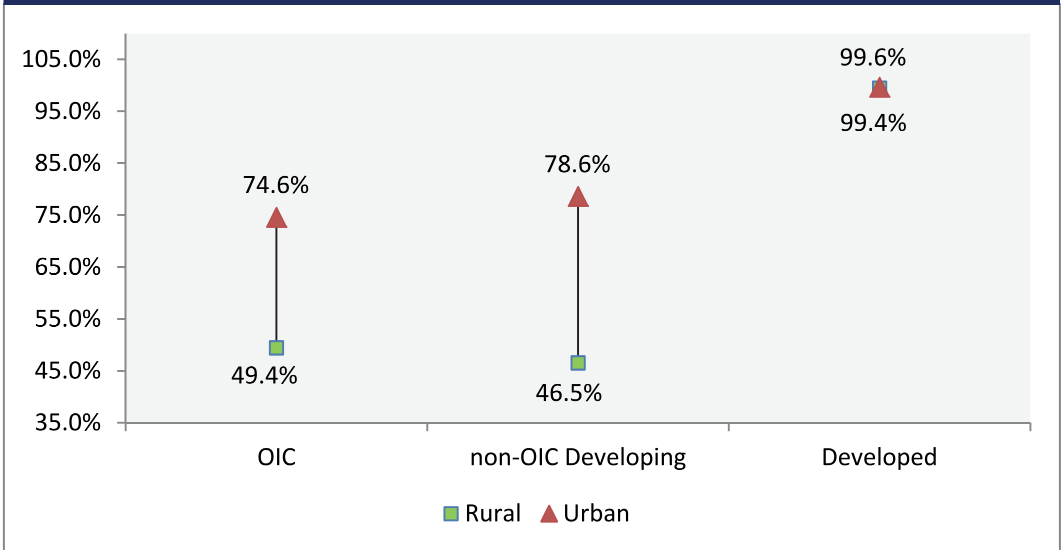
FIGURE 5.7
Access to Improved Sanitation Facilities, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

Not only is the access to improved sanitation facilities limited in developing countries, but the problem is also compounded by the large disparities in access between urban and rural settings as demonstrated by Figure 5.8. The access to improved sanitation facilities in rural areas in developing countries significantly lags that in urban areas by 25.2% in OIC countries and 32.1% in non-OIC developing countries. In stark contrast, in developed countries the access rates are almost identical.

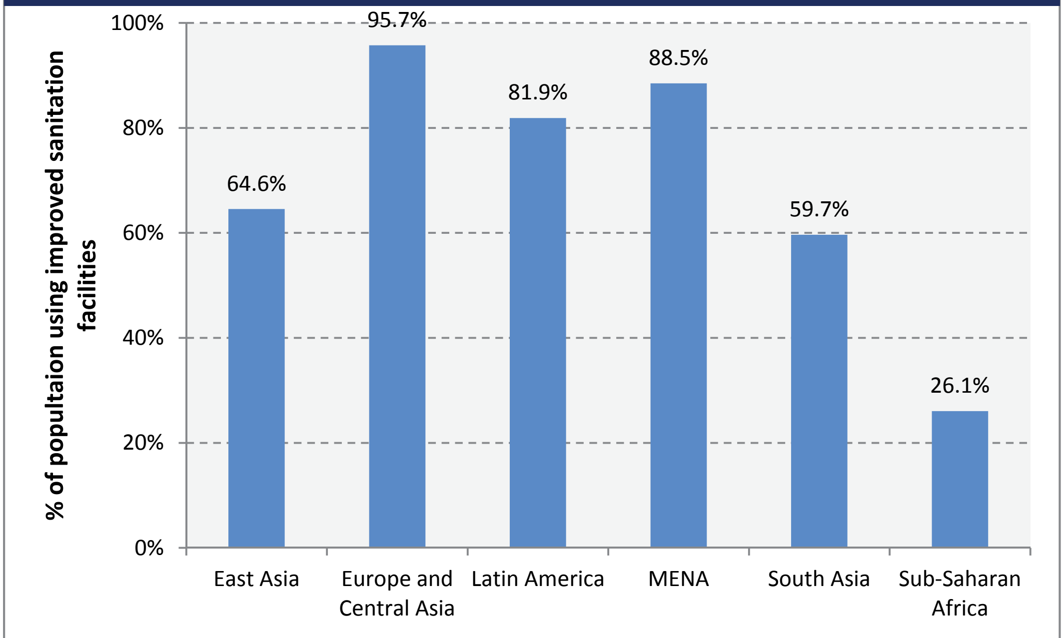
FIGURE 5.8
Disparities in Rural and Urban Access to Improved Sanitation Facilities, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

OIC regions exhibit large variability in access to improved sanitation facilities as shown in 5.9. The highest access rates are observed in OIC countries in Europe and Central Asia (95.7% of population), followed by OIC countries in the Middle East and North Africa (88.5% of population) and OIC countries in Latin America (81.9% of population). On the other hand, the situation is quite dire in OIC countries in Sub-Saharan Africa where only 26.1% of the population have access to improved sanitation facilities. Also in OIC counties in South Asia and OIC countries in East Asia access to improved sanitation facilities are rather low, registering access rates of 59.7% and 64.6% respectively.

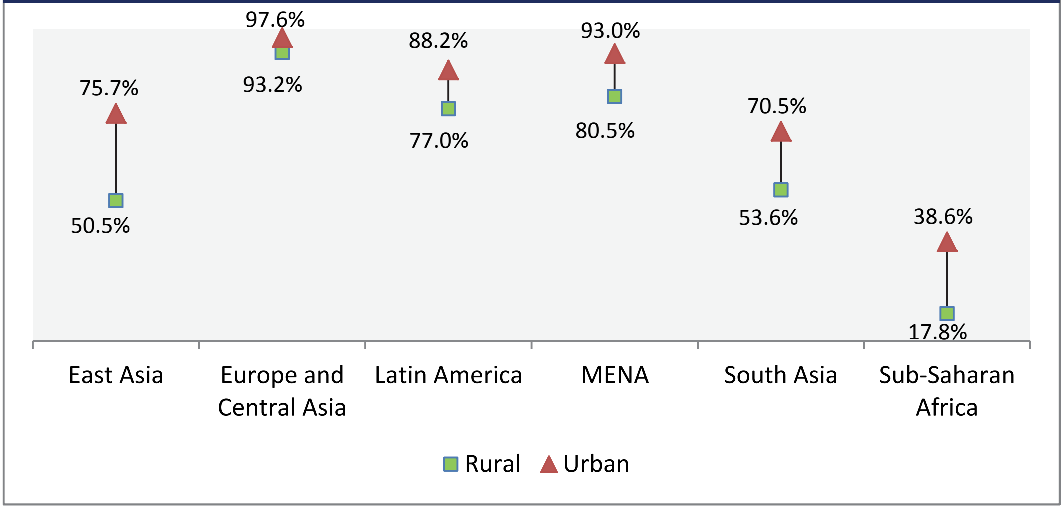
FIGURE 5.9
Access to Improved Sanitation Facilities in OIC Regions, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

In OIC countries, the variability in access rates to improved sanitation facilities is not limited to interregional variability; also significant amount of variability between urban and rural areas exists (Figure 5.10). The highest variability between urban and rural areas in access to improved sanitation facilities is observed in OIC countries in East Asia where 50.5% of rural population have access compared to 75.7% for urban population, corresponding to a gap of 25.2%. Next in line are OIC countries in Sub-Saharan Africa and OIC countries in South Asia that register gaps of 20.8% and 16.9% respectively. In contrast, the lowest variability in access rates to improved sanitation facilities between urban and rural areas is observed in OIC countries in Europe and Central Asia where 97.6% of urban population have access to improved sanitation facilities compared with 93.2% for rural population. The second and third lowest variability in access to improved sanitation facilities between urban and rural areas is observed in OIC countries in Latin America and OIC countries in the Middle East and North Africa that register gaps of 11.2% and 12.5% respectively.

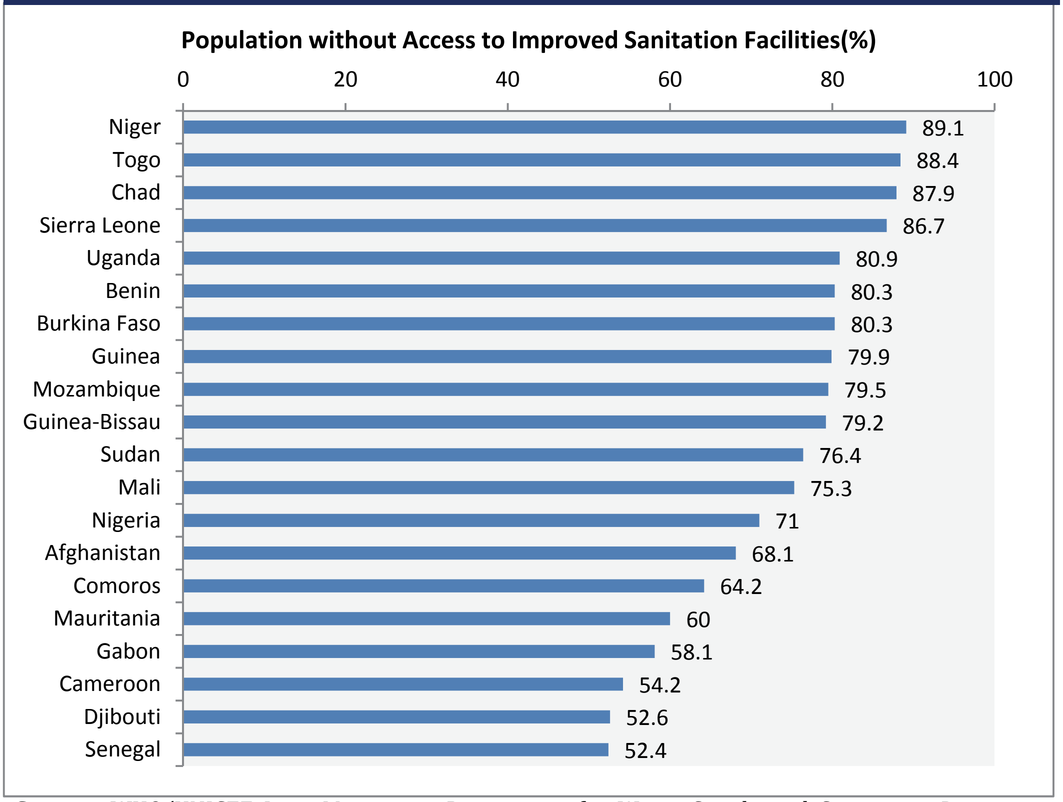
FIGURE 5.10
Disparities in Rural and Urban Access to Improved Sanitation Facilities in OIC Regions, 2015



Source: *SESRIC Staff Calculations based on WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation*

At the individual country level, access to improved sanitation facilities is uneven with some countries having large proportions of their population without access. In total, there are 20 OIC countries where more than half of the population are without access to improved sanitation facilities (Figure 5.11)

FIGURE 5.11
OIC Countries with Low Access Rates to Improved Sanitation Facilities, 2015



Source: *WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Data not available for 6 OIC countries which are: Brunei Darussalam, Côte d'Ivoire, Libya, Palestine, Somalia, and Turkmenistan .*

Finally, while OIC countries have recorded some progress in the areas of providing access to improved drinking water and sanitation facilities for their populations, stark disparities between regions, and between urban and rural areas exist, with the majority of people without access being poor people living in rural areas. Striving to achieve universal access to improved drinking water and sanitation facilities in OIC countries is not just a perquisite to ensure human dignity, a human condition mandated by Allah Almighty in the holy Quran[6], but also a perquisite to reduce the number of death of children under the age of five, as well as reduce under nutrition, poverty and large disparities between the rich and poor.

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[6] وَلَقَدْ كَرَّمْنَا بَنِي آدَمَ وَحَمَلْنَاهُمْ فِي الْبَرِّ وَالْبَحْرِ وَرَزَقْنَاهُمْ مِنَ الطَّيِّبَاتِ وَفَضَّلْنَاهُمْ عَلَىٰ كَثِيرٍ مِمَّنْ خَلَقْنَا تَفْضِيلًا.سورة الاسراء الآية 70.

NOW, INDEED, We have conferred dignity on the children of Adam, and borne them over land and sea, and provided for them sustenance out of the good things of life, and favoured them far above most of our creation. Surah Al-Israa, Ayah 70

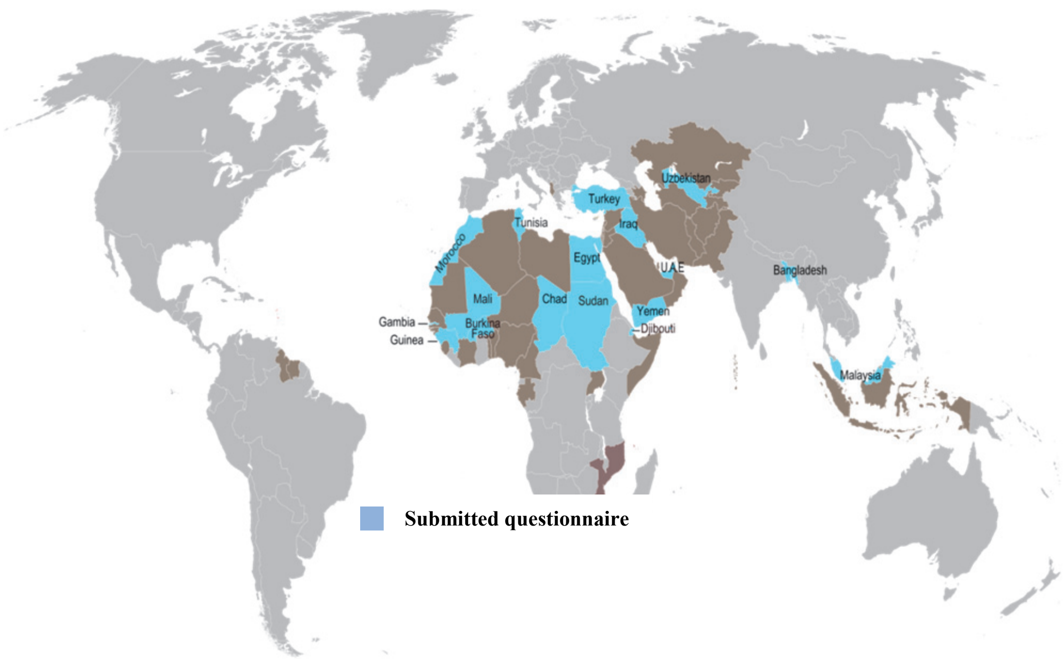
6. Implementation of the OIC Water Vision

Noting that many OIC member countries are prone to intensified water-related problems, such as the increased incidence of droughts and floods, water quality degradation, and unreliability of food production, the 2nd Islamic Conference of Ministers Responsible for Water adopted the OIC Water Vision in Istanbul in 2012. The OIC Water Vision is a framework of cooperation among OIC member countries, relevant OIC institutions and international organizations in the water sector to improve availability of water particularly potable water in OIC countries. It aims to catalyse improved water security in OIC countries through connecting centres of excellence within the OIC in water science, policy, management and technology development; identifying solutions to water problems through increased dialogue and exchange of experience; and promoting solutions to water security challenges in the national and international agendas of OIC leaders.

Provided the fact that more than three years have passed since the adoption of the OIC Water Vision, the OIC General Secretariat in collaboration with the Turkish Water Institute (SUEN) and the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC) prepared a questionnaire on the “Implementation of the OIC Water Vision and Future Cooperation Activities”. The questionnaire aimed to gather information on implementation of the OIC Water Vision; identify the key water-related challenges facing OIC countries; and learn about the future actions and strategies to address these challenges. The questionnaire was sent by email to the “National Focal Points for the OIC Water Vision” in April 2015, and was accessible online through the OIC water web portal[7]. SESRIC established this web portal as per the recommendation of the Second Islamic Conference of Ministers Responsible for Water. Currently, the web portal also hosts a Water Forum for the member countries and experts to share their experiences, ideas, expertise and best practices.

The questionnaire consists of three parts (see Annex B). In the first part, respondents answered 12 questions about achievements and challenges in the implementation of OIC Water Vision. In the second part, there were 40 questions to profile the overall capacities and needs of OIC countries by analysing water resource availability, consumption, infrastructure, financing, trans-boundary water management, and socio-economic and physical climates. The last part inquired about the way forward for the OIC countries and their main challenges, priorities and opportunities for the 5-10 years ahead. As of August 2015, 17 OIC countries responded to the Questionnaire (see Map), corresponding to 30% of OIC member countries with representation from all major geographical regions.

MAP: Questionnaire Submission Status

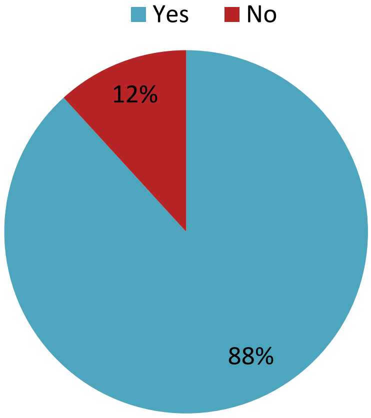


Achievements

In most of the countries surveyed (88%), the OIC Water Vision document has already been circulated to the relevant departments and the implementation of various recommended actions and activities is in progress. Besides, the majority of responding countries have also adopted, updated, and /or evaluated a comprehensive national policy on water issues since the adoption of the OIC Water Vision in 2012 (Figure 6.1). Among the 17 respondents, only Guinea and Tunisia responded negatively about the existence of a comprehensive water policy at national level; whereas, Djibouti and Egypt provided no information about the implementation status of the OIC Water Vision.

[7] http://www.sesrtcic.org/oic-water-vision.php

FIGURE 6.1
Existence of Comprehensive Water Policy Since 2012

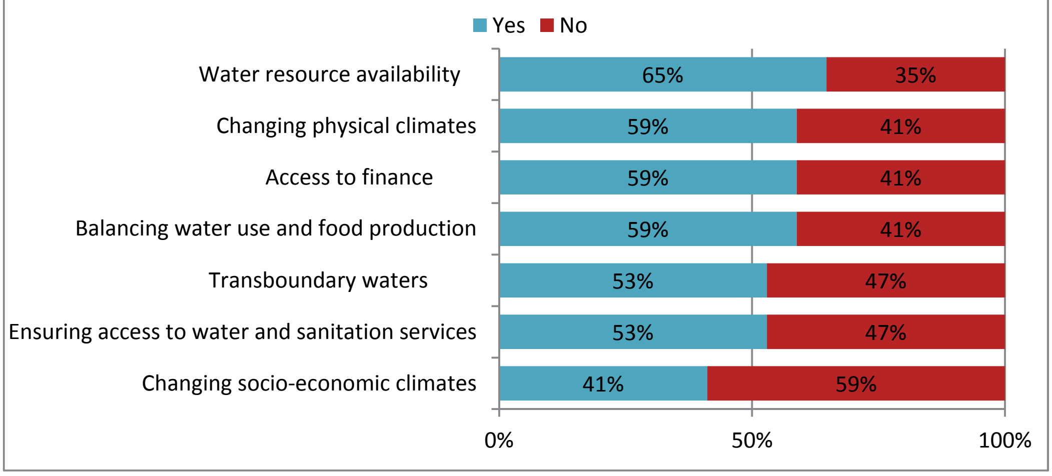


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Major Challenges

In spite of geographical and environmental diversity, respondent countries show common general features regarding the water security related challenges listed in the OIC Water Vision. As shown in Figure 6.2, more than half of the respondents mentioned six out of seven challenges listed in the OIC Water Vision as major threats to their water security. With a 65% approval rate, water resource availability is the number one challenge followed by changing physical climate, access to finance and balancing water use and food production. On the opposite side of the scale, changing socio-economic climates is the least of the concerns for the majority (59%) of the respondents. At the individual country level, Mali reported all seven challenges listed in the OIC Water Vision as the major challenges followed by Guinea and Burkina Faso which listed six out of seven as the major challenges.

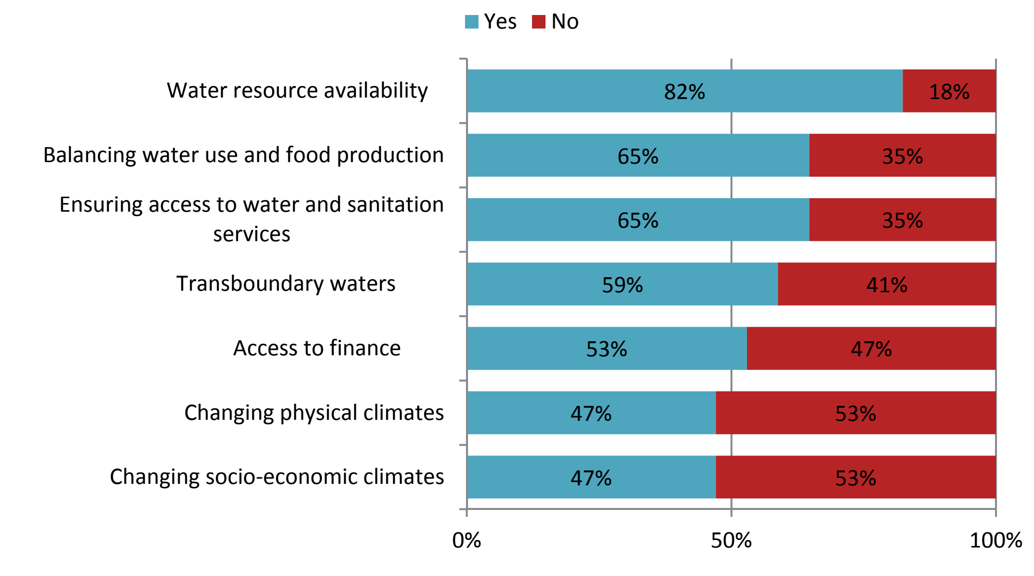
FIGURE 6.2
Major Water Security Challenges



Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

The results of the questionnaire reveal that more than half of the respondents have specific policies, strategies and /or action to address five out of seven major water security challenges listed in the OIC Water Vision. As shown in Figure 6.3, over 82% of the respondents have a policy to address the water resource availability related issues, 65% for balancing water use and food production, and ensuring access to water and sanitation services. On the opposite side of the scale, less than half (47%) of the respondents have a policy to address the challenges of changing socio-economic and physical climates. Among the respondents, four countries namely: Burkina Faso, Guinea, Mali and Turkey reported having specific policies, strategies and /or action to address the all major challenges listed in the OIC Water Vision.

FIGURE 6.3
Specific Policies, Strategies and/or Action to address e Water Challenges

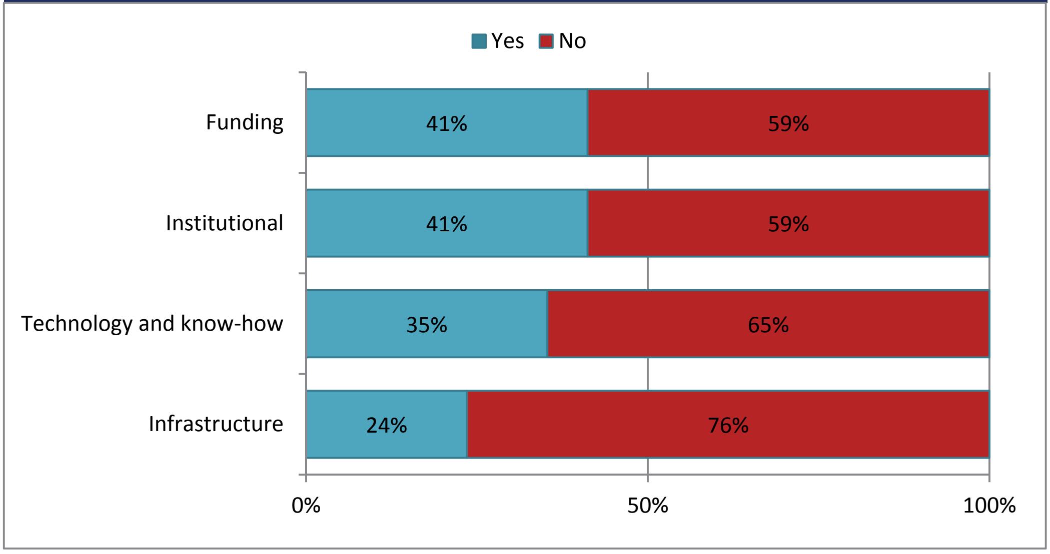


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Difficulties and Obstacles

It is a widely held opinion that financial, institutional, technological, and infrastructure related difficulties and obstacles are hindering the developing world, including many OIC countries, in achieving a water secure future. Nevertheless, this does not seem to be the case for the majority of the 17 respondents. As shown in Figure 6.4, none of the above-mentioned obstacles is an issue for the majority of the respondents. Among these obstacles, funding and institution related difficulties were the main concerns but only for 41% of respondents whereas; less than a quarter (24%) of countries mentioned infrastructure as the major obstacle in implementing the OIC Water Vision. Among the 17 respondents, none of these four obstacles is a major concern for four countries namely: Bangladesh, Chad, Djibouti and Egypt.

FIGURE 6.4
Difficulties and Obstacles in Implementing the OIC Water Vision

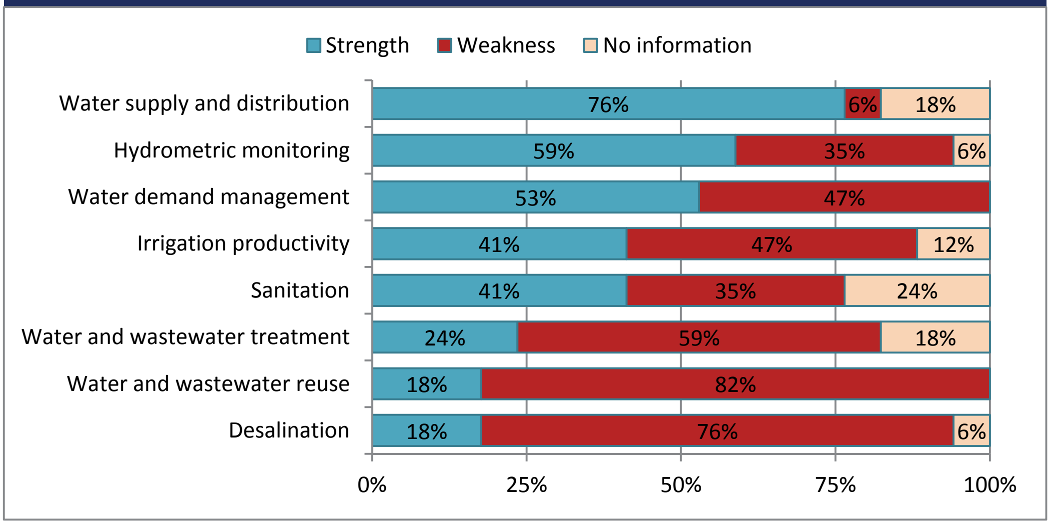


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Strengths and Weaknesses

In line with the different levels of socio-economic development, strengths and weakness in terms of technology, know-how, and experience vary across the OIC countries (Figure 6.5). Over three quarters (76%) of respondent countries excel in water supply and distribution followed by hydrometric monitoring (59%), and water demand management (53%). On the other hand, water and waste water reuse, desalination, and water and waste water treatment were reported as weakness by 82%, 76% and 59% of the respondents respectively.

FIGURE 6.5
Strengths and Weaknesses in terms of Technology, Know-How, and Experiences

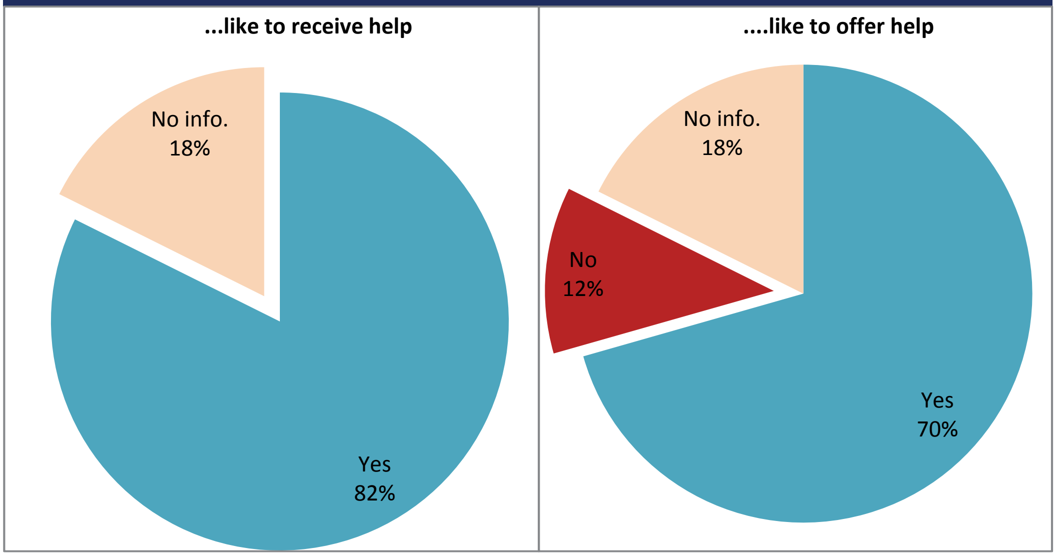


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Technical Assistance and Capacity Building

There is a widespread acknowledgement that south-south cooperation could play an important role in bridging the gap between developing countries by facilitating the exchange of information and transfer of knowledge and expertise. Results of the questionnaire reveal that there is an increasing level of awareness as well as willingness among the OIC member countries to mainstream the idea of south-south cooperation in water resource management. As shown in Figure 6.6, 82% of the respondents were affirmative to seek help from other OIC countries to achieve water security; whereas, 70% of the respondents showed their readiness to offer help to other OIC countries.

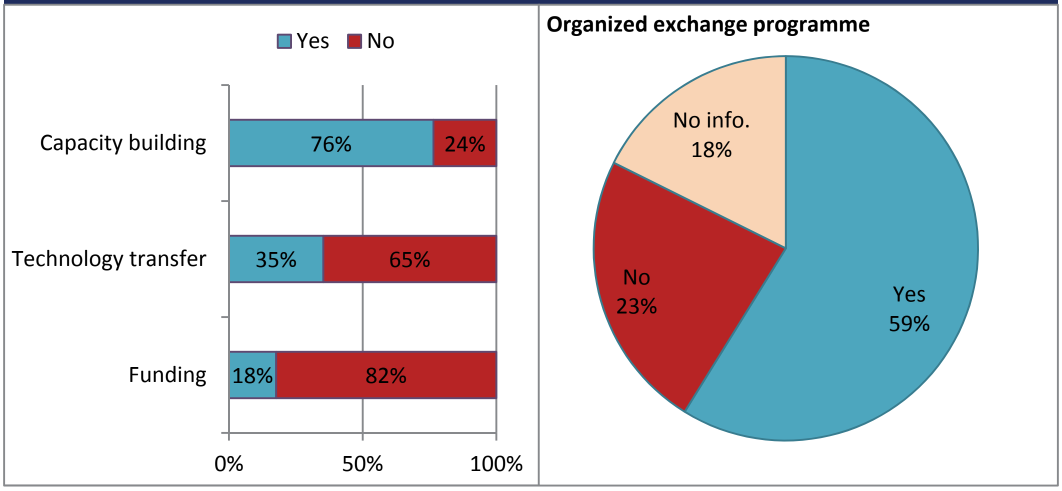
FIGURE 6.6
Would you like to Receive/Offer Help to Other OIC Countries?



Source: Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.

However, the respondents have shown mixed reactions to the question about their readiness to help other OIC countries in different fields like capacity building, technology transfer and funding to achieve water security. As shown in Figure 6.7, a significant majority (76%) of respondents are ready to help others through capacity building programmes. Though funding was recognized as one of the major obstacles in the implementation of the OIC Water Vision, only 18% of respondents are affirmative to use this option to help others. Meanwhile, over one third (35%) of respondents expressed their readiness to help other OIC countries to achieve water security by facilitating the technology transfer. Although three quarters (76%) of respondents showed interest in offering capacity-building programmes to other OIC countries, only 59% of respondents have actually been cooperating with other OIC countries through information and experience exchange programs, which covered a wide range of water related issues such as sanitation and hygiene; wastewater management and water quality; water harvesting; flood management and disaster mitigation measures; and water saving techniques and technologies. Furthermore, about a quarter (23%) of respondents never participated in an exchange programme with other OIC countries whereas; 18% of respondents refrained from giving any information in this regard.

FIGURE 6.7
Readiness to Offer Help in Different Fields and Cooperation through Exchange Programmes

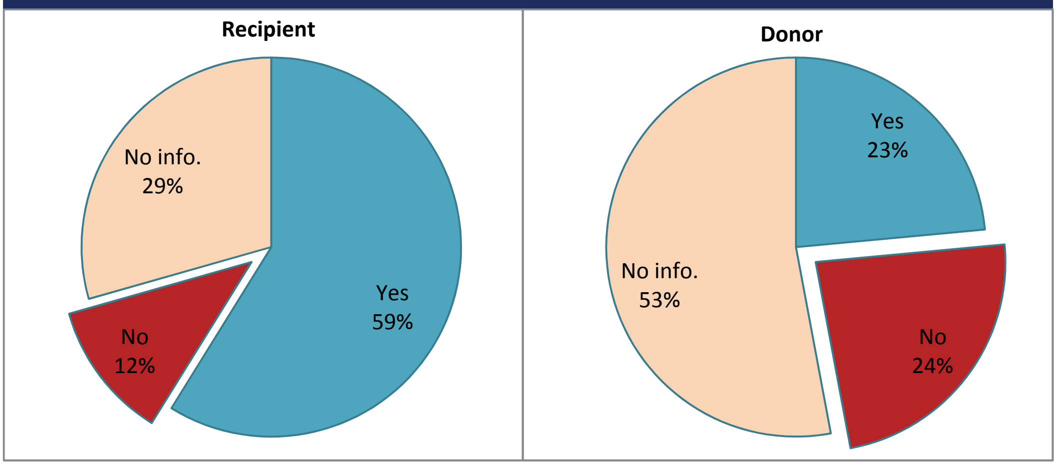


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Development Assistance

Among the 17 countries that have completed the questionnaire, 59% countries have received aid as development assistance from other OIC countries while 12% received no aid at all, about one third of respondents refrained from providing any information in this regard (Figure 6.8). Nearly a quarter (23%) of recipient countries in fact received aid from Gulf Cooperation Council (GCC) countries like Saudi Arabia, Qatar and UAE etc. On the other side, only 23% of respondents reported that they donated development assistance to other OIC countries to improve the water security situation. Majority of respondents refrained from providing any information regarding this issue. Among the respondents, Egypt and Iraq are listed both as recipient and donor country.

FIGURE 6.8
Does your Country Receive/Donate Aid as Development Assistance?

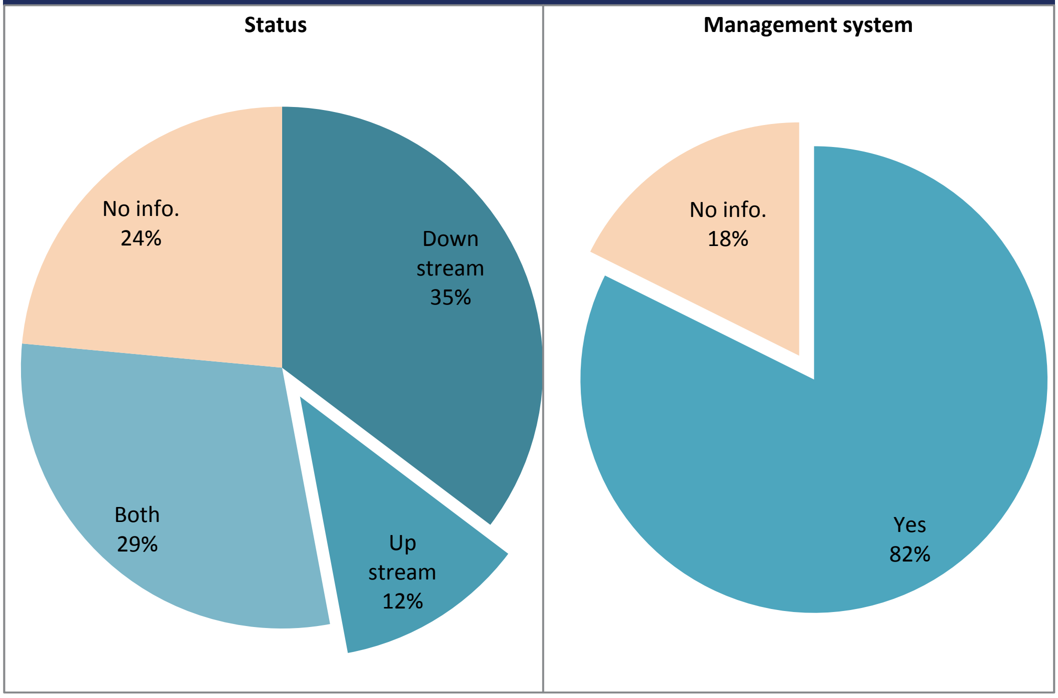


Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Trans-boundary Water Management

Trans-boundary water management is a major issue for many OIC countries. As shown in Figure 6.9, about 76% of respondents are concerned about recipient water rights and management. Around 35% of responded have reported their status as downstream country, 12% as upstream country and 29% have mixed status. Among the 17 respondents, 82% have a trans-boundary water management system whereas 18% provided no information in this regard. About 70% of the respondents were affirmative about trans-boundary water management system based on cooperation with the riparian country.

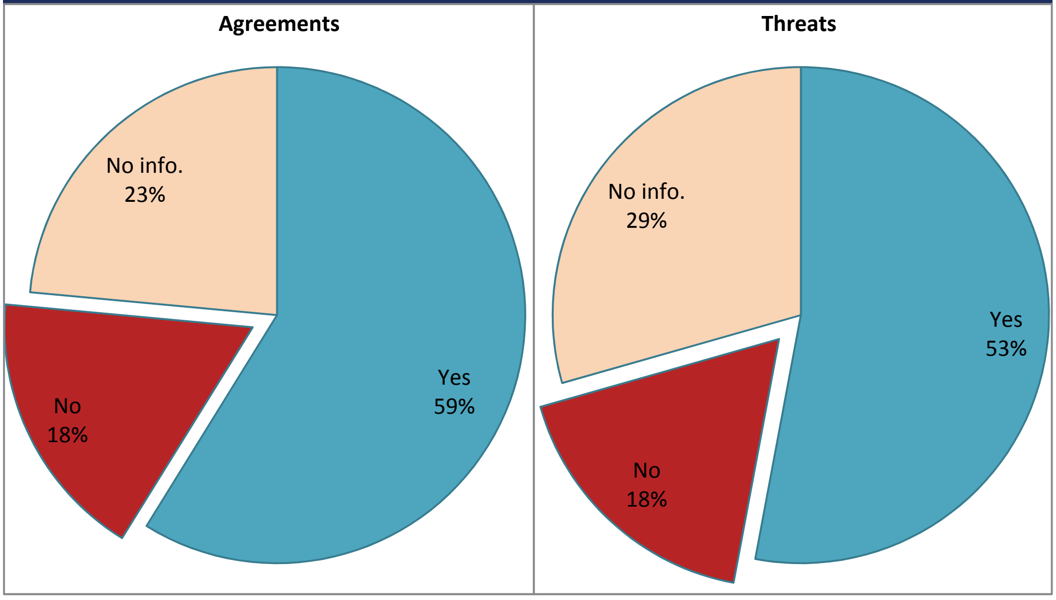
FIGURE 6.9
Trans-boundary Water Management



Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Over the years, many countries have already developed joint agreements and management procedures to cooperate and coordinate regarding the trans-boundary water resources. As shown in Figure 6.10, 59% of respondents have agreements regarding water allocation with other riparian countries, 18% have no agreement and 23% refrained from giving any information. Those countries which have bilateral agreements usually cooperate with riparian countries by sharing hydrological information and data, forecasting of floods and droughts, conducting joint research and development studies to improve trans-boundary water management. Besides, they also provide technical assistance, training, and capacity building programmes to promote exchange of expertise and transfer of knowledge.

FIGURE 6.10
Trans-boundary Water Management related Agreements and Threats



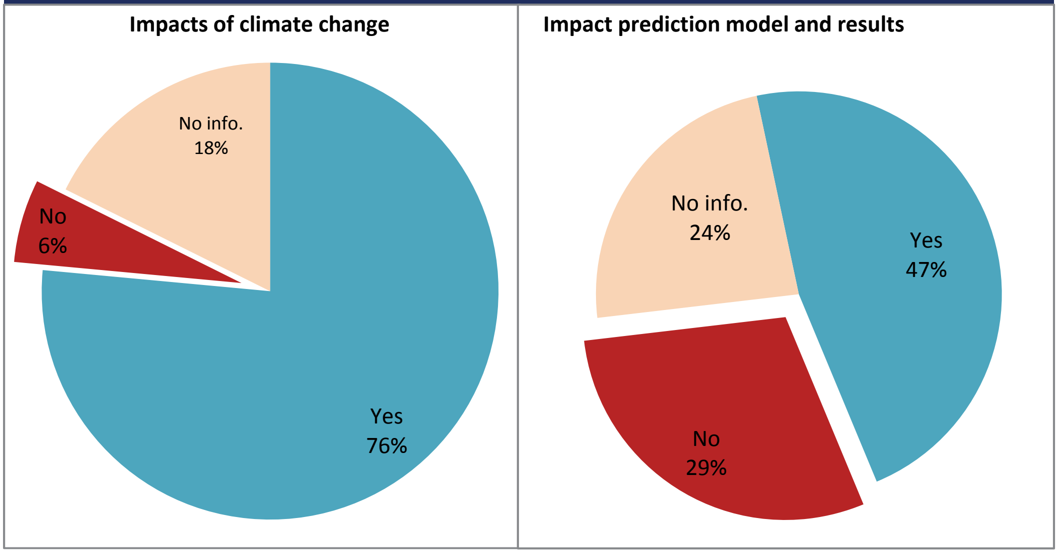
Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Despite having joint agreements, many countries are still facing severe threats regarding the trans-boundary water resources that could cause conflicts with the riparian countries. As shown in Figure 6.10, 53% of respondents believe that there are major threats on the trans-boundary waters. Among these countries, Bangladesh, Tunisia and UAE are suffering from over abstraction and salinity; Guinea, Iraq and Uzbekistan are facing polluted return flows; and Gambia and Turkey are facing problems due to new dam construction and climate change respectively.

Climate Change

Climate change is one of the most serious threats to the global environmental sustainability today. Abnormal weather conditions and thus the unexpected natural disasters such as floods, droughts, or tsunamis, which cause the death or evacuation of many people especially the poor, are the main concern. Many OIC countries are vulnerable to climate change mainly due to their geographic location, degree of reliance on agriculture and low adaptive capacities. Among the 17 countries that have responded to the questionnaire, 76% countries have observed and recorded impacts of climate change including decrease in precipitation, irregular rainfall, recurring floods, decrease in ground water etc. A minority (6%) of countries reported no impacts of climate change whereas 18% of respondents refrained from giving any information on this issue (Figure 6.11). Around half (47%) of the respondents have been using specific models to predict the future impacts of the climate change on their physical climate and water resources for the 5-10 years period . On the other hand, around two third (29%) of respondents do not use any model for the prediction (Figure 6.11).

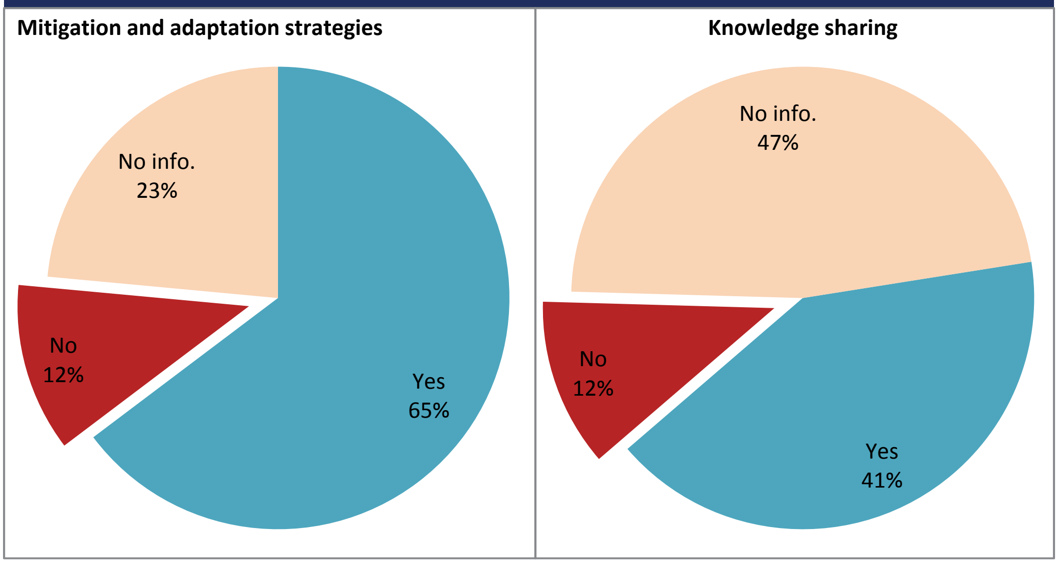
FIGURE 6.11
Impacts of Climate Change and Prediction Models and Results for 5-10 Years



Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Mitigation and adaptation are key elements of an effective climate change policy in a country/region. Based on the results of the questionnaire, about two third (65%) of respondents reported existence of mitigation and adaptation strategies for the impacts of climate change on water resources at national level with varying degrees of focus on short, medium and long term impacts (Figure 6.12). On the other hand, 12% of countries have no mitigation and adaptation policy and about a quarter (23%) of them refrained from giving any information in this regard.

FIGURE 6.12
Mitigation and Adaptation Strategies for Climatic Impacts on Water and Knowledge Sharing



Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

Across the OIC countries, mitigating the negative impacts of climate change on water resources is a common and major challenge, despite the great diversity of water environments. The OIC's great diversity and great water challenges, coupled with its shared beliefs, together provide an extraordinary opportunity for its member states to work together to ensure a water secure future, sharing varied experiences and learning from what has and has not worked. In this regard, 41% of the respondents expressed their readiness to share their best practices with other OIC countries (Figure 6.12). Though, 12% of respondents responded negatively to this answer, nearly half of respondents in fact refrained from providing any information.

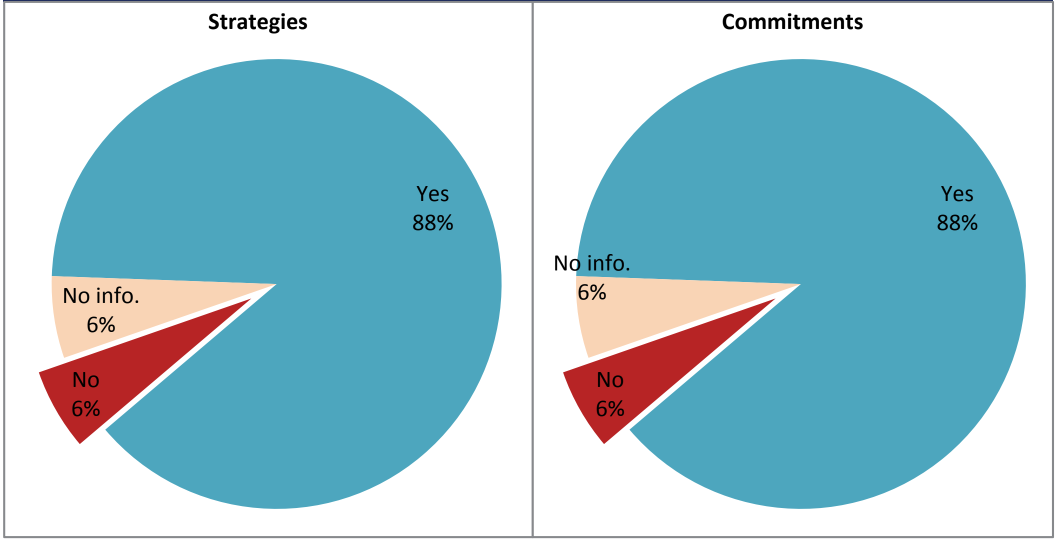
Challenges, Priorities and Opportunities for the Future

The last part of the questionnaire inquires about the main challenges, priorities and strategies for the coming 5-10 years to address the issue of water security in OIC countries. The question related to the main challenges, priorities and opportunities facing a water-secure future was answered by the all respondents except Djibouti. With respect to major challenges, about two third (64%) of the respondents identified at least one of the following issues as challenge: population growth and increase in water demand; impacts of climate change; sustainable use of water resources; waste water treatment and reuse; and rapid urbanization. Though ensuring wider access to the fresh water resources remained one of the top priorities in majority of responding countries, many respondents also mentioned rationalization of water use, controlling water pollution and modernization of water infrastructure as their national priorities to achieve a water security. Majority (70%) of respondents refrained from giving any information about the available opportunities; however the rest of them expressed their readiness to capitalize on existing legal and policy frameworks, finalization of trans-boundary water sharing treatise, and encouraging participatory water resource management approaches to attain the goal of water security in the next 5-10 years.

Strategies and Commitments for the Future

Amon the 17 respondents of the questionnaire, 88% of countries indicated that they have strategies for achieving water security to be carried out at the national level over the next 5-10 years (Figure 6.13). Guinea and Sudan either responded negatively or refrained from answering the question. Almost all (88%) of the respondents have indicated that they are bound to national, regional, and/or international commitments to achieve water security targets in the next 5-10 years (Figure 6.13) . Two respondents namely: Sudan and Yemen either responded negatively or provided no information in this regard. Mostly commitments of responding countries were about at least one of the following issues: improving the accessibility of water; decreasing water loss and waste; promotion of non-conventional water resources; improving the efficiency and productive use of water resources; and signing bilateral, regional, and international conventions on water issues.

FIGURE 6.13
Strategies and Commitments for Achieving Water Security over the Next 5-10 Years



Source: *Based on results from Questionnaire on "Implementation of the OIC Water Vision and Future Cooperation Activities", conducted in 2015.*

7. Concluding Remarks and Policy Recommendations

OIC countries face a number of serious water-related constraints and challenges that should be carefully addressed by the relevant national authorities and policy makers. These constraints and challenges can be summarized as follows:

- Limited water availability: the OIC share of the world's total renewable water resources is limited especially when compared with its population. Also, water resources have a very uneven distribution among OIC regions, with OIC countries in the more arid climates of the Middle East and North Africa region having to rely on non-renewable groundwater sources to alleviate the limitation of renewable water resources, thus subjecting the non-renewable groundwater sources to the risk of depletion. All these challenges are compounded by the fact that many OIC countries have relatively weak water infrastructure that limits their ability to store and transport water and thus reducing water availability across time and space.
- Increasing water demand: in the OIC, high population growth and urbanization rates, coupled with increased incomes and consumerism are pushing the demand for water higher. The increased demand for water is observed across all water using sectors (agricultural, industrial, and municipal), and this in turn is placing unprecedented pressure on water resources in OIC countries.
- Water scarcity: almost half of OIC countries face some level of water scarcity resulting in: unsatisfied demand necessary for human and economic

development, competition between water users, disputes, depletion of water resources and harm to the environment.

- Difficulties in balancing water use and food production: increasing demand for water from the industrial and municipal sectors are threatening to divert water resources from the agricultural sector, thus creating serious implications for food security.
- Providing universal access to improved drinking water and sanitation facilities: there are stark disparities between regions and between rural and urban areas in the OIC countries in terms of providing access to improved drinking water and sanitation facilities, with the majority of people without access being poor people living in rural areas.

The starting point for addressing the above challenges is to adopt a knowledge-based approach grounded in the comprehensive understanding of the causes of water-related challenges and their impacts, both at the national and local scale. Relying on intuition, gut feeling, trial and error and guessing will not help solve the problem; on the contrary, might lead to the escalation of the problems. The foundation for the knowledge-based approach lies in a detailed accounting of water supply and demand and patterns of water use, which vary in time and space, and the use of this information in identifying, adopting and developing water related strategies. In this regard, it is also important to understand the linkages between the different sectors of the economy, as more often than not, the causes of water-related challenges lie outside the water domain; specifically, in the economic, agricultural and energy policies that lead to the unsustainable use of water resources.

Policy, legislations and fiscal decisions shape the realities on the ground at the national and local level. Therefore, it is of vital importance that all the policies, pieces of legislations and fiscal decision that affect water availability, water demand, allocation of water among different users and service delivery are in total alignment with each other. To achieve this, OIC countries need well formulated national water strategies, which meet the following two conditions:

- Strategies that establish SMART[8] goals and Key Performance Indicators (KPIs) for measuring the progress
- Backing policies and goals with sufficient finances in annual budgets and expenditure frameworks.

The different roles, responsibilities, objectives and interests of the various stakeholders involved in water policy need to be well understood and defined. The objectives of different water using sectors may be misaligned and contradictory; therefore, harmonizing the actions of different water stakeholders is paramount to achieve optimized and sustainable water use. Here, and according to the logic of "political economy" one danger may arise; which is the neglecting of the interests of the poor and marginalized in favour of large agricultural producers and industry who possess a strong political voice. Hence, policies and legislations should ensure equality and fairness.

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[8] **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, **T**imely

To successfully implement national water strategies, OIC countries need to develop strong institutional capacities that are capable of achieving goals. One example of strong water institutions in OIC countries is SUEN (Turkish Water Institute) which is show-cased in Box 7.1.

Box 7.1
SUEN: An Example of Strong Institutional Capacity

Establishment:
SUEN was established in 2011 as a subsidiary of Turkey's Ministry of Forestry and Water Affairs. Located in Istanbul with a total staff of 35 employees, SUEN acts as a think tank to contribute to sustainable water policies

Mandate:
SUEN conducts scientific research in various fields related to water, brings together water experts through global networks, national and international fora, conferences, meetings as well as training programs

Projects:
- *Surface and Groundwater Modelling*

With the ultimate goal of ensuring the sustainable use of transboundary water resources, SUEN undertakes surface and groundwater modelling projects that result in management plans to solve possible water problems.

- *WatEUr*

SUEN represents Turkey in the "WatEUr – Tackling European Water Challenges" project, which is supported by the European Commission under the 7th Framework Program.

- *Water & Green Growth*

SUEN took part in the Water and Green Growth Project (WGG) as the local consultant for the Golden Horn case study in Istanbul.

Forum & Meetings:
Water experts from all over the world have been gathered by SUEN through following events:
- 5th World Water Forum (2009)
- International Istanbul Water Forum (every 3 years)
- D8 Water Cooperation Meeting
- OIC Water Vision Meetings (continuously)
- International Network of Basin Organization for Europe (2012)

Training & Capacity Building Programs:
One of the roles of SUEN is carrying out training programs to achieve sustainable water management at beneficiary institutions. Participants are awarded with certificates upon successful completion of the program. The trainings covered following topics:
- Planning in the water sector
- Water and wastewater treatment
- Wastewater management in rural areas
- Water and sewage network management
- Groundwater management
- Site visits to treatment plants

Around 500 participants were trained by SUEN from various countries listed below:
- In cooperation with TIKA (Turkish Cooperation and coordination Agency), water authorities from African countries including Ghana, South Sudan, Malawi, Nigeria, Sudan, Kenya, Ruanda, Somalia, Gambia, Senegal, Uganda, Chad, Djibouti and Tanzania
- Azerbaijan, Azersu ASC
- Afghanistan Ministry of Energy and Water Resources
- Ministry of Municipalities Najaf Water Authority from Iraq
- Palestine Ministry of Local Authorities
- Saudi Arabia water companies

In addition to institutional capacity, there is a need to develop technical capacities in all water-related fields such as: hydrology, water and waste water management, water treatment, water quality monitoring, water law, water efficiency and water resources modelling. To facilitate the building of capacities, knowledge sharing and transfer can play a big role. In the OIC, there are many centres of excellences in both water knowledge and practice and these centres of excellences should be encouraged to exchange knowledge among them-selves and transfer their expertise to OIC countries in need. Also, technical cooperation between OIC countries can help leverage the assets and strengths of OIC institutions and improve their overall capacity. One excellent initiative in the area of capacity building that deserve pointing out is the Water Resources Management Capacity Building Programme (Water-CaB) developed by SESRIC. Water-CaB aims to play an active role in facilitating the exchange of knowledge, experience and best practices in the domain of water among OIC member countries, and by doing so, contribute to the implementation of the OIC Water Vision.

Increasing water availability and managing water demand are the first building blocks in water resources management. Increasing water availability is hindered by the weak water infrastructure in the OIC as reflected in the indicators of water storage capacity (see Section 1.3) and the proportion of waste water that is treated (see Section 1.5), thus OIC countries need to upgrade their water infrastructure and commit the required finances to do so. On the other hand, demand management is more complex as it is dependent on evolving human needs and cultural and societal values. The use and distribution of water in the OIC is sub-optimal as reflected in the low "water productivity" indicator (see Section 2.4). OIC countries need to use water resources in the most productive way by encouraging efficient use of water, cutting water losses and shifting the use of water from less to more beneficial uses.

Water is the base for food production and security. Because of insufficient irrigation infrastructure as reflected by the indicator "percentage of agricultural area equipped for irrigation" (see Section 4.3), most OIC countries depend on rain-fed agriculture which has significantly lower crop yields than irrigated agriculture. Accordingly, irrigation holds the most potential for increasing food production and increasing food security. In this respect, it is crucial for OIC countries to expand the irrigated area and use the most water saving irrigation techniques when doing so (i.e. localized irrigation).

The final word in this report is about the topic of water related hazards (floods and droughts) and natural disasters. These disasters limit economic and social development by destructing fixed assets, damaging productive capacities and market access, demolishing transport, health, communications and energy infrastructure, and causing death, disablement and forced migration. In the OIC countries, and during the 1970- 2014 period, the cost of water related disasters amounted to a total of 66.3 US$ billion; more specifically, floods accounted for 60.8 US$ billion in costs and droughts accounted for 5.5 US$ billion in costs *(Source: SESRIC staff calculations based on EM-DAT: The OFDA/CRED International Disaster Database*). It is true that water hazards cannot be stopped;

nonetheless, OIC countries can minimize disaster risks and impacts by reducing social, economic and environmental vulnerability and improving prevention and preparedness for response[9].

[9] While it is beyond the scope of this report to fully discuss policy recommendations for managing water related disasters, the SESRIC study titled: "*Managing Disasters and Conflicts in OIC Countries*", which is available at SESRIC website and accessible through the following link: http://www.sesric.org/publications-detail.php?id=321, could be a good reference.

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DATA SOURCES

FAO AQUASTAT Online Database

UN Population Division Estimates and Projections

WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation

World Bank WDI Online Database

Yale University 2014 Environmental Performance Index

ANNEX A: STATISTICAL TABLES

Table A.1: Population (in thousands)

	1990	1995	2000	2005	2010	2015	2020	2025	2030
Afghanistan	11731.2	17586.1	20595.4	24860.9	28397.8	32006.8	35666.9	39571.1	43499.6
Albania	3446.9	3357.9	3304.9	3196.1	3150.1	3197.0	3242.7	3283.0	3310.6
Algeria	26239.7	29315.5	31719.5	33960.9	37062.8	40633.5	43829.7	46480.3	48561.4
Azerbaijan	7216.5	7770.8	8117.7	8563.4	9094.7	9612.6	10029.8	10309.3	10474.4
Bahrain	495.9	563.7	668.2	879.5	1251.5	1359.7	1480.1	1570.7	1642.0
Bangladesh	107385.8	119869.6	132383.3	143135.2	151125.5	160411.2	169566.0	177884.9	185063.6
Benin	5001.3	5985.7	6949.4	8182.4	9509.8	10879.8	12343.8	13891.4	15506.8
Brunei	256.9	295.0	331.8	367.8	400.6	428.5	454.1	477.8	499.4
Burkina Faso	8811.0	10089.9	11607.9	13421.9	15540.3	17914.6	20542.3	23427.8	26564.3
Cameroon	12070.4	13929.6	15927.7	18137.7	20624.3	23393.1	26405.1	29628.1	33074.2
Chad	5951.6	6980.4	8301.2	10014.4	11720.8	13605.6	15733.5	18185.0	20877.5
Comoros	412.8	465.9	528.3	600.7	683.1	770.1	859.8	954.5	1057.2
Côte d'Ivoire	12115.8	14217.4	16131.3	17394.0	18976.6	21295.3	23769.8	26414.2	29227.2
Djibouti	589.9	664.0	722.9	776.6	834.0	899.7	964.6	1023.5	1075.1
Egypt	56336.6	61168.4	66136.6	71777.7	78075.7	84705.7	91061.6	96989.0	102552.8
Gabon	946.7	1080.5	1225.5	1379.5	1556.2	1751.2	1954.6	2164.8	2382.4
Gambia	916.8	1065.7	1228.9	1436.5	1680.6	1970.1	2297.2	2660.0	3056.4
Guinea	6020.1	7837.2	8746.1	9576.3	10876.0	12347.8	13926.6	15589.9	17322.1
Guinea-Bissau	1017.4	1139.7	1273.3	1421.5	1586.6	1787.8	2003.9	2232.8	2472.6
Guyana	725.0	728.1	744.5	760.8	786.1	807.6	825.3	841.0	852.7
Indonesia	178633.2	194112.6	208938.7	224480.9	240676.5	255708.8	269413.5	282011.4	293482.5
Iran	56361.9	60468.4	65911.1	70152.4	74462.3	79476.3	84148.6	88064.4	91336.3
Iraq	17517.5	20363.1	23801.2	27377.1	30962.4	35766.7	40699.3	45891.8	50966.6
Jordan	3358.5	4320.2	4767.5	5239.4	6454.6	7689.8	8086.7	8741.6	9355.2
Kazakhstan	16171.9	15549.6	14575.6	15064.1	15921.1	16770.5	17519.5	18115.6	18572.8
Kuwait	2059.8	1586.1	1906.2	2296.3	2991.6	3583.4	4014.8	4432.1	4832.8
Kyrgyzstan	4394.5	4592.1	4954.9	5042.4	5334.2	5707.5	6162.4	6556.6	6871.1
Lebanon	2703.0	3033.4	3235.4	3986.9	4341.1	5053.6	4877.2	5043.3	5172.0
Libya	4259.8	4747.6	5176.2	5594.5	6040.6	6317.1	6767.2	7145.5	7459.4
Malaysia	18211.1	20725.4	23420.8	25843.5	28275.8	30651.2	32858.1	34956.3	36845.5
Maldives	215.9	245.0	272.7	297.6	325.7	358.0	387.6	413.8	435.9
Mali	7964.1	8988.9	10260.6	11941.3	13986.0	16258.6	19059.9	22319.0	26034.1
Mauritania	2024.2	2334.4	2708.1	3146.2	3609.4	4080.2	4576.7	5097.1	5640.3
Morocco	24675.0	26833.1	28710.1	30125.5	31642.4	33955.2	35936.5	37722.6	39190.3
Mozambique	13568.0	15981.6	18275.6	21010.4	23967.3	27121.8	30553.1	34458.6	38875.9
Niger	7753.9	9167.1	10989.8	13183.8	15893.8	19268.4	23422.0	28477.5	34512.8
Nigeria	95617.4	108424.8	122876.7	139585.9	159707.8	183523.4	210158.9	239874.4	273120.4
Oman	1810.1	2154.6	2192.5	2522.3	2802.8	4157.8	4513.9	4770.3	4920.3
Pakistan	111090.9	126689.6	143832.0	157971.4	173149.3	188144.0	203351.2	218123.8	231743.9
Palestine	2081.3	2598.4	3204.6	3559.9	4012.9	4548.8	5139.9	5768.6	6410.2
Qatar	476.5	501.2	593.7	821.2	1749.7	2350.5	2542.8	2662.2	2760.3
Saudi Arabia	16206.1	18567.3	20144.6	24690.1	27258.4	29897.7	32340.9	34206.8	35634.2
Senegal	7514.1	8711.5	9861.7	11270.8	12950.6	14967.5	17123.4	19415.3	21855.7
Sierra Leone	4042.7	3927.1	4139.8	5119.9	5752.0	6318.6	6894.2	7470.5	8057.6
Somalia	6321.6	6346.4	7385.4	8466.9	9636.2	11122.7	12820.0	14742.9	16880.1
Sudan	20008.8	24529.7	27729.8	31585.9	35652.0	39613.2	44499.4	49676.0	55077.8
Suriname	406.8	435.8	466.7	499.5	525.0	548.5	569.5	588.2	603.8
Syria	12451.5	14338.2	16371.2	18167.4	21532.7	22265.0	25735.6	27865.0	29933.9
Tajikistan	5297.3	5784.3	6186.2	6805.7	7627.3	8610.4	9601.9	10538.6	11407.0
Togo	3787.6	4284.5	4864.8	5540.2	6306.0	7170.8	8075.6	9019.0	10015.0
Tunisia	8135.3	8982.6	9552.8	10051.4	10631.8	11235.3	11782.5	12231.2	12561.2
Turkey	53994.6	58522.3	63174.5	67743.1	72137.6	76690.5	80309.4	83712.9	86825.4
Turkmenistan	3668.0	4188.0	4501.4	4747.8	5042.0	5373.5	5685.3	5951.3	6159.9
Uganda	17534.8	20740.7	24275.6	28724.9	33987.2	40141.3	47087.8	54832.1	63387.7
UAE	1806.5	2346.3	3026.4	4148.9	8441.5	9577.1	10601.6	11479.1	12330.4
Uzbekistan	20555.1	22950.9	24828.6	26044.4	27769.3	29709.9	31495.2	32991.3	34146.9
Yemen	11790.2	15018.2	17522.5	20139.7	22763.0	25535.1	28423.4	31279.5	33991.0
OIC Countries	1032158	1157202	1281280	1412833	1557253	1709046	1864193	2020225	2176478
non-OIC Developing Countries	3413274	3679906	3913730	4138213	4364827	4596885	4811785	5003629	5172963
Developed Countries	880798.1	910803.5	939537.4	970577	1002441	1028016	1050784	1070480	1087340
World	5326230	5747911	6134548	6521623	6924520	7333947	7726762	8094335	8436782

Source: UN Population Division Estimates and Projections

Table A.2: Renewable water resources, 2014

	IRWR billion m³/year	ERWR billion m³/year	TRWR billion m³/year	TRWR/Capita (m³/inhabitant/year)
Afghanistan	47.2	18.2	65.3	2138.3
Albania	26.9	3.3	30.2	9517.8
Algeria	11.3	0.4	11.7	297.6
Azerbaijan	8.1	26.6	34.7	3684.3
Bahrain	0.0	0.1	0.1	87.1
Bangladesh	105.0	1122.0	1227.0	7835.5
Benin	10.3	16.1	26.4	2556.4
Brunei	8.5	0.0	8.5	20334.9
Burkina Faso	12.5	1.0	13.5	797.2
Cameroon	273.0	10.2	283.1	12721.3
Chad	15.0	30.7	45.7	3563.4
Comoros	1.2	0.0	1.2	1632.7
Côte d'Ivoire	76.8	7.3	84.1	4141.6
Djibouti	0.3	0.0	0.3	343.6
Egypt	1.8	56.5	58.3	710.5
Gabon	164.0	2.0	166.0	99282.3
Gambia	3.0	5.0	8.0	4326.7
Guinea	226.0	0.0	226.0	19242.2
Guinea-Bissau	16.0	15.4	31.4	18427.2
Guyana	241.0	30.0	271.0	338750.0
Indonesia	2019.0	0.0	2019.0	8080.3
Iran	128.5	8.5	137.0	1769.0
Iraq	35.2	54.7	89.9	2661.3
Jordan	0.7	0.3	0.9	128.8
Kazakhstan	64.4	44.1	108.4	6593.3
Kuwait	0.0	0.0	0.0	5.9
Kyrgyzstan	48.9	-25.3	23.6	4257.4
Lebanon	4.8	-0.3	4.5	933.8
Libya	0.7	0.0	0.7	112.9
Malaysia	580.0	0.0	580.0	19517.4
Maldives	0.0	0.0	0.0	87.0
Mali	60.0	60.0	120.0	7842.1
Mauritania	0.4	11.0	11.4	2930.6
Morocco	29.0	0.0	29.0	878.6
Mozambique	100.3	116.8	217.1	8403.7
Niger	3.5	30.6	34.1	1909.6
Nigeria	221.0	65.2	286.2	1648.5
Oman	0.8	0.0	0.8	193.5
Pakistan	1.4	0.0	1.4	385.5
Palestine	55.0	191.8	246.8	1355.0
Qatar	0.1	0.0	0.1	26.7
Saudi Arabia	2.4	0.0	2.4	83.2
Senegal	25.8	13.2	39.0	2757.4
Sierra Leone	160.0	0.0	160.0	26264.0
Somalia	6.0	8.7	14.7	1400.5
Sudan	4.0	33.8	37.8	995.7
Suriname	99.0	0.0	99.0	183673.5
Syria	7.1	9.7	16.8	767.2
Tajikistan	63.5	-41.6	21.9	2669.3
Togo	11.5	3.2	14.7	2156.4
Tunisia	4.2	0.4	4.6	419.7
Turkey	227.0	-15.4	211.6	2823.9
Turkmenistan	1.4	23.4	24.8	4727.1
Uganda	39.0	21.1	60.1	1599.3
UAE	0.2	0.0	0.2	16.0
Uzbekistan	16.3	32.5	48.9	1689.0
Yemen	2.1	0.0	2.1	86.0
OIC Countries	1991.0	7262.0	5271.0	4407
non-OIC Developing Countries	9147.0	37898.3	28751.4	8428
Developed Countries	641.9	9545.9	8904.0	9438
World	11779.9	54706.2	42926.4	7645
OIC - East Asia	0.0	2607.5	2607.5	9312
OIC - Europe and Central Asia	47.6	504.1	456.5	3319
OIC - Latin America	30.0	370.0	340.0	276326
OIC - MENA	130.3	360.8	230.5	913
OIC - South Asia	1332.0	1539.2	207.2	4164
OIC - Sub-Saharan Africa	451.2	1880.5	1429.3	4180

Source: FAO AQUASTAT Online Database

Table A3: Dam capacity, latest data available between 1993 and 2015

	Dam Capacity (billion m^3)	Dam capacity Per Capita (m^3/inhabitant)
Afghanistan	2.009	65.8
Albania	4.030	1270.1
Algeria	5.676	144.8
Azerbaijan	21.500	2284.1
Bahrain		
Bangladesh	6.477	41.4
Benin	0.024	2.3
Brunei	0.045	107.7
Burkina Faso	5.287	312.2
Cameroon	15.610	701.4
Chad		
Comoros		
Côte d'Ivoire	37.240	1833.0
Djibouti		
Egypt	168.200	2049.8
Gabon	0.220	131.6
Gambia		
Guinea	1.837	156.4
Guinea-Bissau		
Guyana	0.809	1011.5
Indonesia	23.020	92.1
Iran	32.240	416.3
Iraq	151.800	4495.8
Jordan	0.275	37.8
Kazakhstan	79.950	4862.8
Kuwait		
Kyrgyzstan	23.500	4235.8
Lebanon	0.228	47.3
Libya	0.385	62.0
Malaysia	22.450	755.5
Maldives		
Mali	13.610	889.4
Mauritania	0.500	128.5
Morocco	17.500	530.2
Mozambique	77.470	2998.8
Niger	0.076	4.2
Nigeria	45.630	262.8
Oman	0.088	24.3
Pakistan	27.810	152.7
Palestine		
Qatar		
Saudi Arabia	1.004	34.8
Senegal	0.250	17.7
Sierra Leone	0.220	36.1
Somalia	0.000	0.0
Sudan	21.230	559.2
Suriname	20.000	37105.8
Syria	19.650	897.3
Tajikistan	29.500	3594.1
Togo	1.717	251.9
Tunisia	2.677	243.4
Turkey	157.300	2099.2
Turkmenistan	6.220	1187.0
Uganda	80.000	2128.8
UAE	0.061	6.5
Uzbekistan	22.160	765.9
Yemen	0.463	18.9
OIC Countries	1147.947	1647736
non-OIC Developing Countries	3624.090	4496901
Developed Countries	1915.255	1011402
World	6687.291	7156039

Source: FAO AQUASTAT Online Database

Table A.4: Dependency ratio (2014)

Country	ratio	Country	ratio	Country	ratio	Region	ratio
Afghanistan	27.8%	Indonesia	0.0%	Qatar	3.4%	OIC	27.4%
Albania	10.9%	Iran	6.2%	Saudi Arabia	0.0%	non-OIC Developing	24.1%
Algeria	3.6%	Iraq	60.8%	Senegal	33.8%	Developed	6.7%
Azerbaijan	76.6%	Jordan	27.2%	Sierra Leone	0.0%	World	21.5%
Bahrain	96.6%	Kazakhstan	40.6%	Somalia	59.2%	OIC - East Asia	0.0%
Bangladesh	91.4%	Kuwait	100.0%	Sudan	89.4%	OIC - Europe and Central Asia	9.4%
Benin	61.0%	Kyrgyzstan	-107.2%	Suriname	0.0%	OIC - Latin America	8.1%
Brunei	0.0%	Lebanon	-6.6%	Syria	57.6%	OIC - MENA	36.1%
Burkina Faso	7.4%	Libya	0.0%	Tajikistan	-189.6%	OIC - South Asia	86.5%
Cameroon	3.6%	Malaysia	0.0%	Togo	21.8%	OIC - Sub-Saharan Africa	24.0%
Chad	67.2%	Maldives	0.0%	Tunisia	9.1%		
Comoros	0.0%	Mali	50.0%	Turkey	-7.3%		
Côte d'Ivoire	8.7%	Mauritania	96.5%	Turkmenistan	94.3%		
Djibouti	0.0%	Morocco	0.0%	Uganda	35.1%		
Egypt	96.9%	Mozambique	53.8%	UAE	0.0%		
Gabon	1.2%	Niger	89.7%	Uzbekistan	66.6%		
Gambia	62.5%	Nigeria	22.8%	Yemen	0.0%		
Guinea	0.0%	Oman	3.0%				
Guinea-Bissau	49.0%	Pakistan	0.0%				
Guyana	11.1%	Palestine	77.7%				

Source: FAO AQUASTAT Online Database

Table A.5: The proportion of collected wastewater that is treated (2014)

Country	%	Country	%	Country	%	Region	%
Afghanistan	0.0%	Indonesia	0.0%	Qatar	67.3%	OIC	14.4%
Albania	3.4%	Iran	2.8%	Saudi Arabia	28.5%	non-OIC Developing	13.7%
Algeria	34.6%	Iraq	8.3%	Senegal	2.1%	Developed	75.4%
Azerbaijan	13.1%	Jordan	42.3%	Sierra Leone	0.0%	World	25.8%
Bahrain	64.3%	Kazakhstan	30.5%	Somalia		OIC - East Asia	15.5%
Bangladesh	0.0%	Kuwait	43.0%	Sudan	0.0%	OIC - Europe and Central Asia	14.0%
Benin	0.0%	Kyrgyzstan	4.2%	Suriname	0.0%	OIC - Latin America	0.0%
Brunei	37.8%	Lebanon	15.1%	Syria	82.2%	OIC - MENA	33.6%
Burkina Faso	0.0%	Libya	18.1%	Tajikistan	2.3%	OIC - South Asia	2.0%
Cameroon	0.0%	Malaysia	8.6%	Togo	0.0%	OIC - Sub-Saharan Africa	0.4%
Chad	0.0%	Maldives	4.6%	Tunisia	27.8%		
Comoros		Mali	0.0%	Turkey	48.9%		
Côte d'Ivoire	0.6%	Mauritania	0.0%	Turkmenistan	9.8%		
Djibouti	0.0%	Morocco	39.4%	Uganda	0.6%		
Egypt	49.5%	Mozambique	2.5%	UAE	67.1%		
Gabon	0.0%	Niger	0.0%	Uzbekistan	0.0%		
Gambia	0.4%	Nigeria	1.1%	Yemen	0.5%		
Guinea	0.8%	Oman	13.4%				
Guinea-Bissau	0.0%	Pakistan	3.5%				
Guyana	0.0%	Palestine					

Source: Yale University. 2014 Environmental Performance Index

Table A6: Pressure on Water Resources, the latest data available between 2000 and 2014

	Annual freshwater withdrawals(billion m^3)	Freshwater withdrawal as % of TRWR
Afghanistan	20.280	31.0%
Albania	1.311	4.3%
Algeria	5.706	48.9%
Azerbaijan	11.970	34.5%
Bahrain	0.239	205.8%
Bangladesh	35.870	2.9%
Benin	0.130	0.5%
Brunei	0.092	1.1%
Burkina Faso	0.818	6.1%
Cameroon	0.966	0.3%
Chad	0.880	1.9%
Comoros	0.010	0.8%
Côte d'Ivoire	1.549	1.8%
Djibouti	0.019	6.3%
Egypt	57.030	97.8%
Gabon	0.139	0.1%
Gambia	0.091	1.1%
Guinea	0.553	0.2%
Guinea-Bissau	0.175	0.6%
Guyana	1.445	0.5%
Indonesia	113.300	5.6%
Iran	92.950	67.9%
Iraq	65.990	73.4%
Jordan	0.866	92.4%
Kazakhstan	19.980	18.4%
Kuwait	0.415	2075.0%
Kyrgyzstan	7.707	32.6%
Lebanon	1.096	24.3%
Libya	4.308	615.4%
Malaysia	11.200	1.9%
Maldives	0.005	15.7%
Mali	5.186	4.3%
Mauritania	1.348	11.8%
Morocco	10.350	35.7%
Mozambique	0.884	0.4%
Niger	0.984	2.9%
Nigeria	13.110	4.6%
Oman	1.186	84.7%
Pakistan	183.500	74.4%
Palestine	0.408	48.8%
Qatar	0.217	374.1%
Saudi Arabia	22.640	943.3%
Senegal	2.221	5.7%
Sierra Leone	0.212	0.1%
Somalia	3.298	22.4%
Sudan	26.930	71.2%
Suriname	0.616	0.6%
Syria	14.140	84.2%
Tajikistan	11.190	51.1%
Togo	0.169	1.2%
Tunisia	3.217	69.7%
Turkey	40.050	18.9%
Turkmenistan	27.870	112.5%
Uganda	0.637	1.1%
UAE	2.800	1867.0%
Uzbekistan	49.160	100.6%
Yemen	3.540	168.6%
OIC Countries	883	12.16%
non-OIC Developing Countries	2009	5.31%
Developed Countries	868	9.09%
World	3760	6.88%
OIC - East Asia	125	4.78%
OIC - Europe and Central Asia	169	33.58%
OIC - Latin America	2	0.56%
OIC - MENA	287	79.59%
OIC - South Asia	240	15.57%
OIC - Sub-Saharan Africa	60	3.21%

Source: FAO AQUASTAT Online Database

Table A.7: Water productivity (2013), constant 2005 US$ GDP per cubic meter of total freshwater withdrawal

Country	Water productivity	Country	Water productivity	Country / Region	Water productivity
Afghanistan	0.6	Jordan	19.6	Suriname	4.0
Albania	8.7	Kazakhstan	4.4	Syria	
Algeria	22.2	Kuwait		Tajikistan	0.3
Azerbaijan	2.6	Kyrgyzstan	0.4	Togo	17.1
Bahrain	65.2	Lebanon	24.7	Tunisia	15.2
Bangladesh	2.7	Libya	8.8	Turkey	16.3
Benin	46.3	Malaysia	18.6	Turkmenistan	0.7
Brunei	109.8	Maldives	288.1	Uganda	49.5
Burkina Faso	10.8	Mali	1.4	UAE	58.8
Cameroon	22.8	Mauritania	2.0	Uzbekistan	0.5
Chad	10.9	Morocco	6.7	Yemen	5.1
Comoros	45.0	Mozambique	12.7	OIC	4.3
Côte d'Ivoire	14.2	Niger	5.3	non-OIC Developing	6.3
Djibouti	54.3	Nigeria	14.0	Developed	43.8
Egypt	1.9	Oman		World	14.5
Gabon	83.4	Pakistan	0.8	OIC - East Asia	5.4
Gambia	9.2	Palestine	14.5	OIC - Europe and Central Asia	4.7
Guinea	6.5	Qatar	292.5	OIC - Latin America	1.7
Guinea-Bissau	4.2	Saudi Arabia	22.0	OIC - MENA	6.0
Guyana	0.7	Senegal	5.1	OIC - South Asia	1.1
Indonesia	4.0	Sierra Leone	11.8	OIC - Sub-Saharan Africa	6.3
Iran	2.6	Somalia			
Iraq	1.3	Sudan	1.1		

Source World Bank WDI Online Database

Table A.8: Water Withdrawals by sector, the latest data available between 2000 and 2014

	Total (billion m^3/year)			Share in total water withdrawals		
	Agriculture	Industry	Municipal	Agriculture	Industry	Municipal
Afghanistan	20.000	0.170	0.203	98.2%	0.8%	1.0%
Albania	0.518	0.232	0.561	39.5%	17.7%	42.8%
Algeria	3.502	0.951	1.581	58.0%	15.8%	26.2%
Azerbaijan	10.100	2.360	0.521	77.8%	18.2%	4.0%
Bahrain	0.159	0.020	0.178	44.5%	5.7%	49.8%
Bangladesh	31.500	0.770	3.600	87.8%	2.1%	10.0%
Benin	0.059	0.030	0.041	45.4%	23.1%	31.5%
Brunei						
Burkina Faso	0.421	0.022	0.376	51.4%	2.7%	45.9%
Cameroon	0.737	0.105	0.247	67.7%	9.6%	22.7%
Chad	0.672	0.104	0.104	76.4%	11.8%	11.8%
Comoros	0.005	0.001	0.005	47.0%	5.0%	48.0%
Côte d'Ivoire	0.595	0.318	0.636	38.4%	20.5%	41.0%
Djibouti	0.003	0.000	0.016	15.8%	0.0%	84.2%
Egypt	59.000	4.000	5.300	86.4%	5.9%	7.8%
Gabon	0.040	0.014	0.085	29.0%	10.1%	60.9%
Gambia	0.039	0.021	0.041	38.6%	20.9%	40.6%
Guinea	0.293	0.056	0.225	51.0%	9.8%	39.2%
Guinea-Bissau	0.144	0.012	0.034	75.8%	6.3%	17.9%
Guyana	1.363	0.020	0.061	94.3%	1.4%	4.2%
Indonesia	92.760	24.650	13.990	70.6%	18.8%	10.6%
Iran	86.000	1.100	6.200	92.2%	1.2%	6.6%
Iraq	52.000	9.700	4.300	78.8%	14.7%	6.5%
Jordan	0.611	0.038	0.291	65.0%	4.1%	31.0%
Kazakhstan	14.000	6.263	0.878	66.2%	29.6%	4.2%
Kuwait	0.492	0.023	0.448	51.1%	2.4%	46.5%
Kyrgyzstan	7.100	0.336	0.224	92.7%	4.4%	2.9%
Lebanon	0.780	0.150	0.380	59.5%	11.5%	29.0%
Libya	3.584	0.132	0.610	82.8%	3.1%	14.1%
Malaysia	2.505	4.788	3.902	22.4%	42.8%	34.9%
Maldives	0.000	0.000	0.006	0.0%	5.1%	94.9%
Mali	5.075	0.004	0.107	97.9%	0.1%	2.1%
Mauritania	1.223	0.032	0.095	90.6%	2.4%	7.1%
Morocco	9.156	0.212	1.063	87.8%	2.0%	10.2%
Mozambique	0.690	0.036	0.254	70.4%	3.7%	25.9%
Niger	0.657	0.014	0.062	89.7%	1.9%	8.4%
Nigeria	7.047	1.965	4.099	53.7%	15.0%	31.3%
Oman	1.168	0.019	0.134	88.4%	1.4%	10.1%
Pakistan	172.400	1.400	9.650	94.0%	0.8%	5.3%
Palestine	0.189	0.029	0.200	45.2%	6.9%	47.8%
Qatar	0.262	0.008	0.174	59.0%	1.8%	39.2%
Saudi Arabia	20.830	0.710	2.130	88.0%	3.0%	9.0%
Senegal	2.065	0.058	0.098	93.0%	2.6%	4.4%
Sierra Leone	0.046	0.056	0.111	21.5%	26.2%	52.3%
Somalia	3.281	0.002	0.015	99.5%	0.1%	0.5%
Sudan	25.910	0.075	0.950	96.2%	0.3%	3.5%
Suriname	0.431	0.136	0.049	70.0%	22.0%	8.0%
Syria	14.670	0.615	1.475	87.5%	3.7%	8.8%
Tajikistan	10.440	0.408	0.647	90.8%	3.5%	5.6%
Togo	0.076	0.006	0.141	34.1%	2.8%	63.1%
Tunisia	2.644	0.165	0.496	80.0%	5.0%	15.0%
Turkey	34.000	4.300	6.200	76.4%	9.7%	13.9%
Turkmenistan	26.360	0.839	0.755	94.3%	3.0%	2.7%
Uganda	0.259	0.050	0.328	40.7%	7.8%	51.5%
UAE	3.312	0.069	0.617	82.8%	1.7%	15.4%
Uzbekistan	50.400	1.500	4.100	90.0%	2.7%	7.3%
Yemen	3.235	0.065	0.265	90.7%	1.8%	7.4%
OIC Countries	784.808	69.158	79.259	84.1%	7.4%	8.5%
non-OIC Developing Countries	1606.330	284.405	233.488	75.6%	13.4%	11.0%
Developed Countries	338.314	380.547	149.206	39.0%	43.8%	17.2%
World	2729.451	734.109	461.953	69.5%	18.7%	11.8%
OIC - East Asia	95.265	29.438	17.892	66.8%	20.6%	12.5%
OIC - Europe and Central Asia	152.918	16.238	13.886	83.5%	8.9%	7.6%
OIC - Latin America	1.794	0.156	0.111	87.1%	7.6%	5.4%
OIC - MENA	261.597	18.007	25.859	85.6%	5.9%	8.5%
OIC - South Asia	223.900	2.340	13.459	93.4%	1.0%	5.6%
OIC - Sub-Saharan Africa	49.334	2.979	8.052	81.7%	4.9%	13.3%

Source: FAO AQUASTAT Online Database

Table A.9: Population using improved drinking-water sources 2012

	Number of people (000)			Percentage share in total population		
	Rural	Urban	Total	Rural	Urban	Total
Afghanistan	22720	7105	29825	56%	90%	64%
Albania	1438	1724	3162	94%	97%	96%
Algeria	10066	28416	38482	79%	85%	84%
Azerbaijan	4296	5013	9309	71%	88%	80%
Bahrain	149	1169	1318	100%	100%	100%
Bangladesh	110051	44644	154695	84%	86%	85%
Benin	5471	4580	10051	69%	85%	76%
Brunei				0%	0%	0%
Burkina Faso	11958	4502	16460	76%	97%	82%
Cameroon	10270	11430	21700	52%	94%	74%
Chad	9726	2722	12448	45%	72%	51%
Comoros	516	202	718	97%	91%	95%
Côte d'Ivoire				68%	92%	80%
Djibouti	197	663	860	65%	100%	92%
Egypt	45492	35230	80722	99%	100%	99%
Gabon	220	1413	1633	63%	97%	92%
Gambia	755	1036	1791	84%	94%	90%
Guinea	7339	4112	11451	65%	92%	75%
Guinea-Bissau	922	742	1664	56%	96%	74%
Guyana	569	226	795	98%	97%	98%
Indonesia	119764	127100	246864	76%	93%	85%
Iran	23535	52889	76424	92%	98%	96%
Iraq	11008	21770	32778	69%	94%	85%
Jordan	1193	5816	7009	90%	97%	96%
Kazakhstan	7572	8699	16271	86%	99%	93%
Kuwait	56	3194	3250	99%	99%	99%
Kyrgyzstan	3536	1938	5474	82%	97%	88%
Lebanon	587	4060	4647	100%	100%	100%
Libya				0%	0%	0%
Malaysia	7755	21485	29240	99%	100%	100%
Maldives	195	143	338	98%	100%	99%
Mali	9570	5284	14854	54%	91%	67%
Mauritania	2212	1584	3796	48%	52%	50%
Morocco	13856	18665	32521	64%	98%	84%
Mozambique	17282	7921	25203	35%	80%	49%
Niger	14056	3101	17157	42%	99%	52%
Nigeria	83991	84843	168834	49%	79%	64%
Oman	872	2442	3314	86%	95%	93%
Pakistan	113743	65417	179160	89%	96%	91%
Palestine				0%	0%	0%
Qatar	22	2029	2051	100%	100%	100%
Saudi Arabia	4949	23339	28288	97%	97%	97%
Senegal	7849	5877	13726	60%	92%	74%
Sierra Leone	3611	2368	5979	42%	87%	60%
Somalia				0%	0%	0%
Sudan	26112	11083	37195	50%	66%	55%
Suriname	160	375	535	88%	98%	95%
Syria	9532	12358	21890	87%	92%	90%
Tajikistan	5883	2126	8009	64%	93%	72%
Togo	4086	2557	6643	41%	92%	61%
Tunisia	3642	7233	10875	90%	100%	97%
Turkey	20368	53629	73997	99%	100%	100%
Turkmenistan	2636	2537	5173	54%	89%	71%
Uganda	30539	5807	36346	71%	95%	75%
UAE	1413	7793	9206	100%	100%	100%
Uzbekistan	18206	10335	28541	81%	98%	87%
Yemen	16006	7846	23852	47%	72%	55%
OIC Countries	616663	698474	1315363	73.6%	92.0%	82.4%
non-OIC Developing Countries	1901356	1996667	3902818	83.2%	96.7%	89.7%
Developed Countries	184073	817519	1002234	98.8%	99.7%	99.6%
World	2702093	3512660	6220415	81.7%	96.4%	89.5%
OIC - East Asia	98698	139688	239074	77.4%	94.0%	86.6%
OIC - Europe and Central Asia	53913	84568	138699	84.3%	98.3%	92.5%
OIC - Latin America	698	587	1287	95.8%	97.6%	96.8%
OIC - MENA	119177	223698	342635	83.6%	95.2%	90.8%
OIC - South Asia	206588	107732	313949	83.7%	91.8%	86.2%
OIC - Sub-Saharan Africa	137588	142201	279719	53.7%	82.9%	65.4%

Source: WHO Global Health Observatory Data Repository

Table A.10: Population using improved sanitation facilities 2012

	Number of people (000)			Percentage share in total population		
	Rural	Urban	Total	Rural	Urban	Total
Afghanistan	22720	7105	29825	23%	47%	29%
Albania	1438	1724	3162	86%	95%	91%
Algeria	10066	28416	38482	88%	98%	95%
Azerbaijan	4296	5013	9309	78%	86%	82%
Bahrain	149	1169	1318	99%	99%	99%
Bangladesh	110051	44644	154695	58%	55%	57%
Benin	5471	4580	10051	5%	25%	14%
Brunei						
Burkina Faso	11958	4502	16460	7%	50%	19%
Cameroon	10270	11430	21700	27%	62%	45%
Chad	9726	2722	12448	6%	31%	12%
Comoros	516	202	718			
Côte d'Ivoire				10%	33%	22%
Djibouti	197	663	860	22%	73%	61%
Egypt	45492	35230	80722	94%	98%	96%
Gabon	220	1413	1633	32%	43%	41%
Gambia	755	1036	1791	55%	64%	60%
Guinea	7339	4112	11451	11%	33%	19%
Guinea-Bissau	922	742	1664	8%	34%	20%
Guyana	569	226	795	82%	88%	84%
Indonesia	119764	127100	246864	46%	71%	59%
Iran	23535	52889	76424	82%	93%	89%
Iraq	11008	21770	32778	82%	86%	85%
Jordan	1193	5816	7009	98%	98%	98%
Kazakhstan	7572	8699	16271	98%	97%	97%
Kuwait	56	3194	3250	100%	100%	100%
Kyrgyzstan	3536	1938	5474	92%	92%	92%
Lebanon						
Libya	1361	4794	6155	96%	97%	97%
Malaysia	7755	21485	29240	95%	96%	96%
Maldives	195	143	338	100%	97%	99%
Mali	9570	5284	14854	15%	35%	22%
Mauritania	2212	1584	3796	9%	51%	27%
Morocco	13856	18665	32521	63%	85%	75%
Mozambique	17282	7921	25203	11%	44%	21%
Niger	14056	3101	17157	4%	33%	9%
Nigeria	83991	84843	168834	25%	31%	28%
Oman	872	2442	3314	95%	97%	97%
Pakistan	113743	65417	179160	34%	72%	48%
Palestine						
Qatar	22	2029	2051	100%	100%	100%
Saudi Arabia	4949	23339	28288	100%	100%	100%
Senegal	7849	5877	13726	40%	67%	52%
Sierra Leone	3611	2368	5979	7%	22%	13%
Somalia						
Sudan	26112	11083	37195	13%	44%	24%
Suriname	160	375	535	61%	88%	80%
Syria	9532	12358	21890	95%	96%	96%
Tajikistan	5883	2126	8009	95%	94%	94%
Togo	4086	2557	6643	2%	25%	11%
Tunisia	3642	7233	10875	77%	97%	90%
Turkey	20368	53629	73997	75%	97%	91%
Turkmenistan	2636	2537	5173	98%	100%	99%
Uganda	30539	5807	36346	34%	33%	34%
UAE	1413	7793	9206	95%	98%	98%
Uzbekistan	18206	10335	28541	100%	100%	100%
Yemen	16006	7846	23852	34%	93%	53%
OIC Countries	392835	555442	948832	46.9%	73.1%	59.4%
non-OIC Developing Countries	980952	1515988	2487540	42.8%	73.4%	57.1%
Developed Countries	165619	773061	938816	99.8%	100.0%	100.0%
World	1539406	2844492	4375189	46.7%	79.0%	63.5%
OIC - East Asia	62459	110867	173720	49.0%	74.6%	62.9%
OIC - Europe and Central Asia	56915	83061	139858	89.0%	96.6%	93.3%
OIC - Latin America	564	529	1096	77.4%	88.0%	82.4%
OIC - MENA	115841	222883	338258	80.8%	94.6%	89.3%
OIC - South Asia	107923	75133	183157	43.7%	64.0%	50.3%
OIC - Sub-Saharan Africa	49133	62971	112744	19.2%	36.8%	26.4%

Source: WHO Global Health Observatory Data Repository

ANNEX B: QUESTIONNAIRE ON THE IMPLEMENTATION OF THE OIC WATER VISION & FUTURE PLANNED ACTIVITIES

This questionnaire aims to:

i. Gather information on the **implementation of the OIC Water Vision** adopted by the Islamic Conference of Ministers Responsible for Water held in Istanbul, Turkey on 5-6 March 2012;
ii. Identify the **key water-related challenges** facing member states; and
iii. Identify **future actions and strategies** to address these challenges.

The information gathered here will be used to prepare a Draft Report on the implementation of the OIC Water Vision by Member States and plan for future activities.

GENERAL INFORMATION

COUNTRY :

Please provide us with information regarding the **contact person** for your country:

Name Surname :	
Name of Institution :	
Position :	
Phone :	
Fax :	
E-mail :	
Address :	

PART I. OVERVIEW OF ACHIEVEMENTS AND CHALLENGES IN THE IMPLEMENTATION OF THE OIC WATER VISION

Water Security Challenges:

1. Please give a brief overview about the efforts for the implementation of the OIC Water Vision in your country.

2. Has a comprehensive policy for water security been adopted, updated or evaluated at national level since 2012?

3. Among the water security challenges listed in the OIC Water Vision, which one(s) is/are of major importance to your country?

   ☐ Water resource availability

   ☐ Ensuring access to water and sanitation services

   ☐ Balancing water use and food production

   ☐ Access to finance

   ☐ Transboundary waters

   ☐ Changing socio-economic climates

   ☐ Changing physical climates

4. For which of the below challenges have specific policies, strategies and/or action been developed? Please explain.

   a. Water resource availability

   b. Ensuring access to water and sanitation services

   c. Balancing water use and food production

   d. Access to finance

   e. Transboundary waters

   f. Changing socio-economic climates

   g. Changing physical climates

5. List some major achievements and/or breakthroughs in concrete terms in implementing the OIC Water Vision.
6. What are the main difficulties and obstacles in your country in the implementation of the OIC Water Vision (institutional, technology, know-how, infrastructure, funding etc.)? Please explain.
7. In which fields do you think your country is strong in terms of technology, know-how and experience?

☐ Water supply and distribution
☐ Water and wastewater treatment
☐ Sanitation
☐ Irrigation productivity
☐ Hydrometric monitoring
☐ Water demand management
☐ Desalination
☐ Water and wastewater reuse
☐ Other (please specify):

8. In which fields do you think your country is weak in terms of technology, know-how and experience?

☐ Water supply and distribution
☐ Water and wastewater treatment
☐ Sanitation
☐ Irrigation productivity
☐ Hydrometric monitoring
☐ Water demand management
☐ Desalination
☐ Water and wastewater reuse
☐ Other (please specify):

9. In which fields can your country help other OIC countries to achieve water security?

☐ Funding
☐ Technology transfer
☐ Capacity building
☐ Other(please specify):

10. Has your country/institution cooperated with another OIC country in an exchange programme (twinning, training, staff exchange etc.) to share information and experience? If yes, which country?

11. Would you like to receive help from other OIC countries concerning your water security problems? If yes, in which fields?

12. Would you like to offer help to other OIC countries to help them achieve water security? If yes, in which fields?

PART II. COUNTRY PROFILES

Water Availability

1. How much freshwater is available in your country?

2. What type of water sources does your country rely on?

☐Surface waters ☐Ground waters ☐ Sea water

3. What is the amount of freshwater available per capita?

4. What is the total amount of annual water withdrawal in your country?

5. What is the percentage of desalinated water withdrawal?

6. What is the percentage of wastewater reuse?

7. How do you classify the quality of available raw water in your country?

8. Can you treat it with your own technology? To what level can you treat?

9. Is there a specific water pollution problem in your country? (e.g. arsenic contamination, sewage pollution, iron and manganese contamination, high hardness, heavy metal pollution, etc.)

10. What is the amount of annual precipitation in your country (mm/year)?

☐ < 500
☐ 500-1000
☐ 1000-2000
☐2000-3000
☐ 3000-4000
☐ > 4000

11. Has there been any important changes in the average annual precipitation recently?

☐ Increased

☐ Decreased

☐No change

12. What is the magnitude and frequency of extreme events such as floods and droughts?

Water Consumption

13. What is the recent trend in per capita water consumption in your country?

14. What is the distribution of water withdrawal among the main sectors (agricultural, domestic, industrial)?

15. What is the amount of water loss in water distribution systems?

16. What is the amount of water loss in agricultural irrigation?

17. Do you take any measures to prevent water losses through leakage, unlicensed tapping or inefficient irrigation methods? Please explain.

Access to Water Supply and Sanitation

18. What is the percentage of population served with improved water supply?

a. Urban:

b. Rural:

19. What is the percentage of population served with improved sanitation services?

    a. Urban:

    b. Rural:

Food Security

20. What is the amount of water used in irrigated agriculture?

21. Do you employ water-efficient irrigation technologies in agriculture? Please explain.

22. What institutional, technological and economic efforts does your country perform to increase agricultural productivity?

Finance

23. What is the percentage of public expenditure on water and sanitation as a share of GDP?

24. What is the level of the private sector investments in the water and sanitation sector?

25. Does your country receive aid from other OIC countries as development assistance for water? Please specify.

26. Does your country donate aid to other OIC countries as development assistance for water? Please specify.

27. What is the distribution of water sector expenditures? (irrigation, water supply, sanitation, planning, education etc.)

Transboundary Waters

28. Does your country have any rivers or aquifers of transboundary nature? If yes, is your country an upstream or a downstream country?

29. How do you manage the transboundary waters in your country? Please explain.

30. How do you cooperate with the other riparian countries for the management of transboundary waters?

31. Do you have any agreements with the riparian countries on the allocation of transboundary waters?

32. What cooperation activities do you perform with other riparian countries?

33. Are there any major threats on the transboundary waters in your country (over-abstraction, polluted return flows, growing salinity, etc.)?

34. Is there any conflict over the use of transboundary waters among the riparian countries?

Changing socio-economic climates

35. What is the percentage of urban population in your country and how has it changed in recent years?

36. Is there any shift in your country's economic policy from agriculture towards industrial and commercial development? How do you think it will affect the water demand?

Changing physical climates

37. What has been the impact of climate change on your country's water resources in recent years?

38. Do you have any models to predict the future impact of climate change on your country's water resources? If yes, what is the prediction for the next 5-10 years?

39. Do you have any mitigation and adaptation strategies for climate change impacts on water resources?

40. Are there any best practices you can share with other OIC countries?

PART III. THE WAY FORWARD: MAIN CHALLENGES, PRIORITIES AND STRATEGIES FOR THE 5-10 YEARS AHEAD

1. What do you think are the main challenges, priorities and opportunities facing a water-secure future for your country?

2. Does your country have any strategies for achieving water security to carry out at the national level over the next 5-10 years?

3. Does your country have any commitments for achieving water security to carry out at the national level over the next 5-10 years?

– THANK YOU –