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OIC OUTLOOK

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WATER RESOURCES AND WATER RELATED ISSUES IN THE OIC MEMBER COUNTRIES

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INTRODUCTION

Fresh water is essential element for life and it is virtual for all human, economical and natural activities like agriculture, industry, household, recreation and environment. Fresh water is only 2.5% of the total water on earth with an over two thirds of it in frozen form. While small fraction flows as surface water or in the air, the rest accumulated as ground water.

As the demand for clean fresh water increases steadily, its supply has been declining at an alarming rates. Water scarcity is emerging as a major development challenge for many countries. While in some countries water availability is a key concern, other countries with expanding urban settlements, industrial sectors, and commercialized agriculture, water quality is a major concern. Still one can argue that water scarcity, whether qualitative, quantitative, or both, originates from inefficient utilization and poor management of water in most of the countries, although the nature and severity of water scarcity vary from one country to another and one region to another.

Beyond controversy, climate change is a serious cause of water resources depletion and other water-related disasters. For example, many of the Organisation of the Islamic Conference (OIC) Member Countries have already witnessed frequent droughts and floods due to global warming.

This report attempts to shed light on some water related issues in the OIC Member Countries. First, the current condition of water resources in the member countries is presented, then, major problems and challenges are discussed, and finally mitigation policies and suggestions for their implementations are proposed.

WATER RESOURCES IN THE OIC MEMBER COUNTRIES

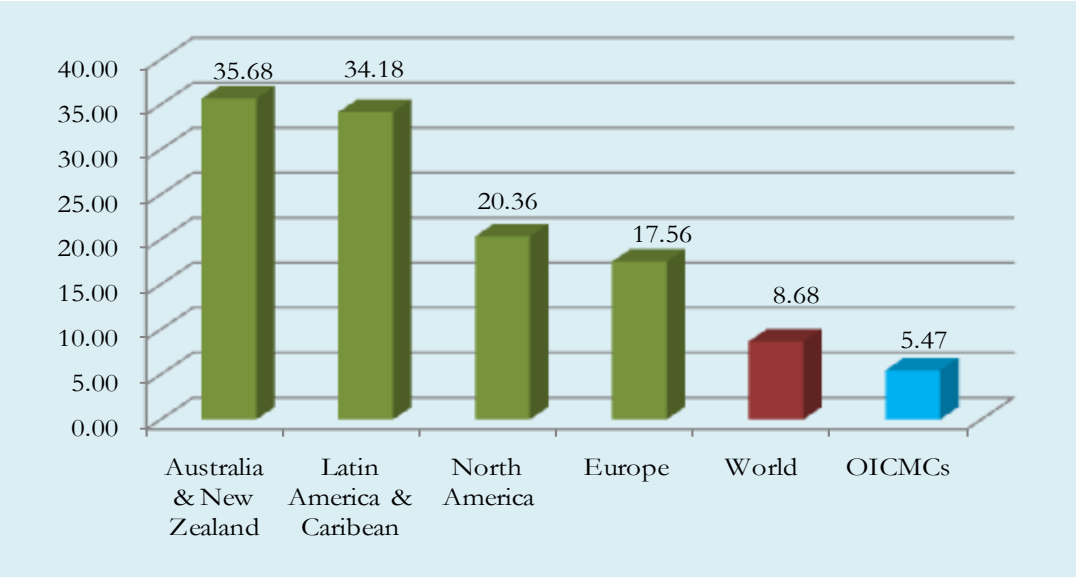
Water resources are generally classified into renewable and non-renewable water resources. Renewable water resources are regenerated by precipitation, while non-renewable or fossil water, are the accumulated underground for millions of years. Internal renewable water resources (IRWRs) are the portion of the water resources generated from endogenous precipitation. It is computed by adding up surface runoff and groundwater recharge occurring inside the countries' borders. Total renewable water resources (TRWRs) refer to the sum of internal renewable water resources and incoming flow originating outside the countries' borders, which called the external renewable water resources (ERWRs).

RENEWABLE WATER RESOURCES

The OIC Member Countries have relatively a small portion of the world total water renewable resources compared to their population and land area. Although the OIC Member Countries cover 20.6% of the world's land area and dwell 22% of its population, they have 8033.32 km^3 of renewable water resources, which represent only 14.55% of the world's total water renewable resources (calculated from FAO-AQUASTAT online data, 2007).

The average of total renewable water resources *per capita* in OIC Member Countries is 5,469m^3/yr, which is lower than the world average (8,680 m^3/yr) and significantly lesser in regions like Europe, the Americas, Australia and New Zealand, as shown in Figure 1.

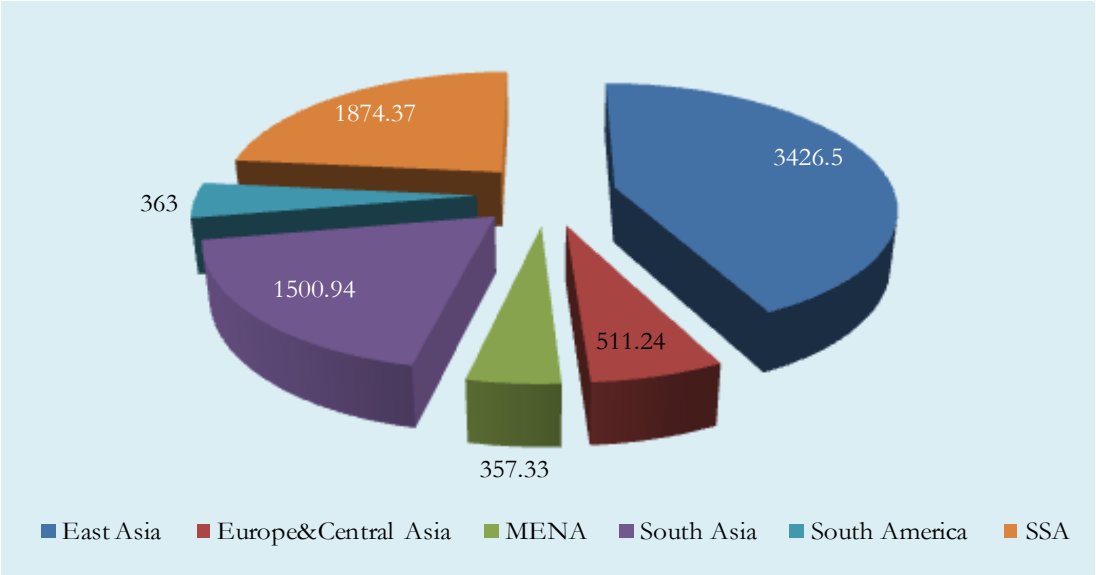
Figure 1: Total Renewable Water Resources per Capita in Regions, 2007 (000m³/yr)



Source: calculated from FAO AQUASTAT online database

Due to wide range of climate conditions, water resources have a very uneven distribution among the OIC Sub-regions. While East Asia (Brunei, Indonesia and Malaysia) has 42% of the total OIC renewable water resources, Middle East and North Africa (MENA), which represents 19 countries, has the least fragment of 4.4%. Similarly, as shown in Figure 2, the twenty one of OIC Sub Saharan Africa Countries (SSA) have the portion of 23.3%; OIC South Asia, represents four countries, has 18%; the eight OIC Countries in Europe and Central Asia account for 6.4%; and OIC South America (two countries) has 4.5% of the total OIC renewable water.

Figure 2: Total Renewable Water Resources in OIC Regions, 2007 (km³)



Source: Calculated from FAO AQUASTAT online database

At individual country level, the allocation of renewable water resources is also varied. In fact, population and the source of renewable water whether internal or external, are the key factors to reflect the actual water status. For example, Indonesia is the richest in terms of TRWRs; however, it is not even in the top ten in terms of TRWRs *per capita* (see Figure 3 and 4). In the other hand, TRWRs of Indonesia is completely internal, which means the value of ERWRs is zero (Figure 5).

Figure 3: Top 10 OIC Countries with the Highest TRWRs, 2007 (km^3)

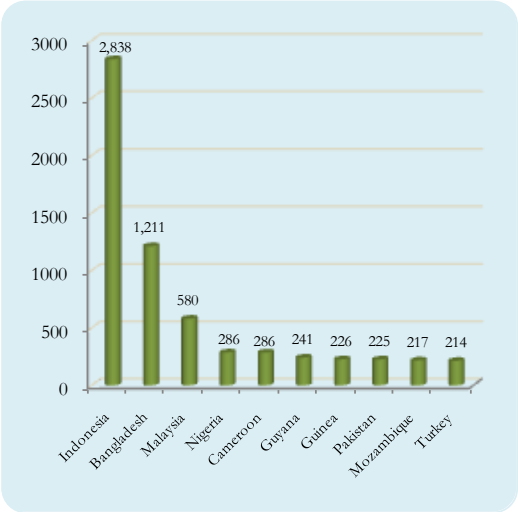
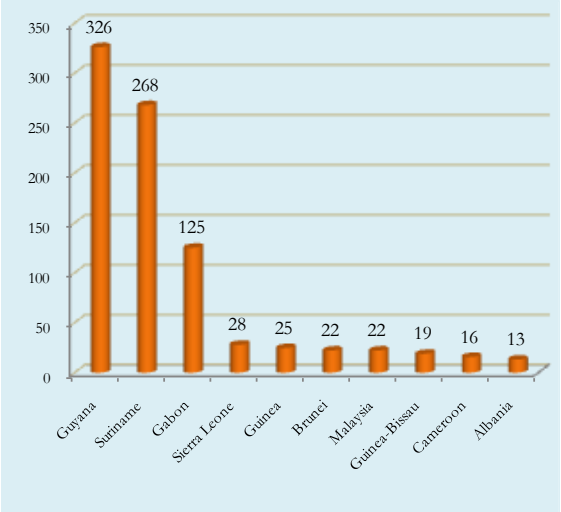


Figure 4: Top 10 OIC Countries with the Highest TRWRs *per capita*, 2007 (m^3)



Source: *FAO AQUASTAT online database*

In the nutshell, Indonesia, Bangladesh, and Malaysia are the richest in TRWRs, Guyana, Suriname, and Gabon have the highest TRWRs *per capita*, due to their limited population. Bangladesh and Pakistan are the highest in ERWRs, which means that most of their water comes from outside their borders.

Figure 5: Top 5 OIC Countries with the Highest Total IRWRs, 2007 (km^3)

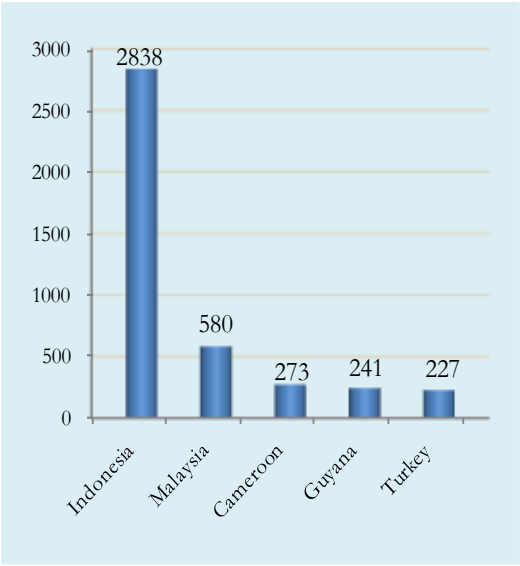
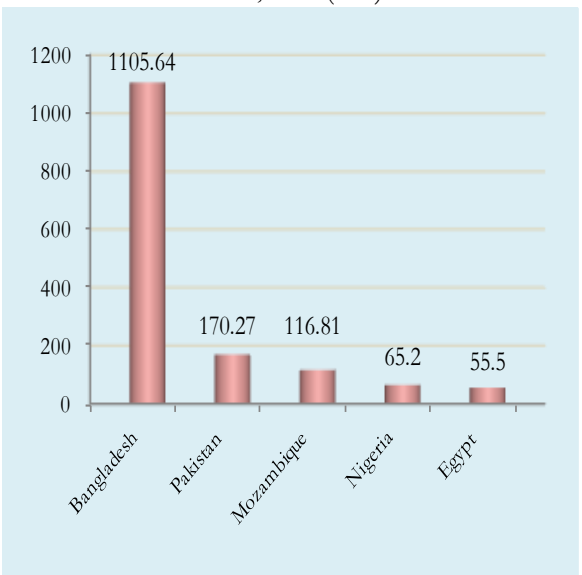


Figure 6: Top 5 OIC Countries with the Highest Total ERWRs, 2007 (km^3)



Source: *FAO AQUASTAT online database*

NON-RENEWABLE WATER RESOURCES

In comparison to the OIC Member Countries and the world, Sub-Saharan Africa has a high potential of fossil groundwater reserves such as the Continental Sahara, Murzuk, the Nubian Basin, the Senegal-Mauritania Basin, the Lullemeden Basin in Niger, and the Chad Basin.

Also MENA has very important fossil aquifers. Some countries rely heavily on these resources like Jordan, Libya, Saudi Arabia, and Bahrain due to their limited renewable water resources. Therefore, the increasing depletion of these resources risks the long-term sustainable use of these resources since it is accumulated for long time and cannot be renewed.

WATER RELATED ISSUES AND CHALLENGES FACING THE OIC MEMBER COUNTRIES

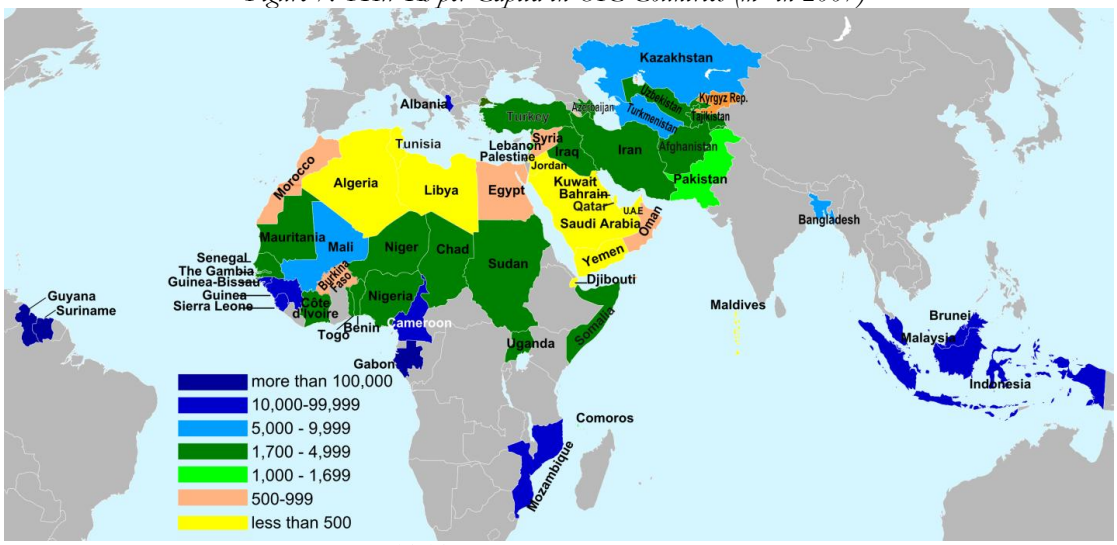
Along the way to development, water is a crucial factor. The OIC Member Countries have to figure out the optimal tradeoff between socio-economic development and sustainable utilization of water resources. Many challenges are facing the OIC Member Countries in this regard. The top priority challenges can be summarized in the following.

SCARCITY OF WATER RESOURCES AND IMPACTS OF CLIMATE CHANGE

Water scarcity is defined as the imbalance of supply and demand of water. The TRWRs required for basic domestic, agricultural, and industrial activities is estimated as a threshold of 1,700m^3 *per capita* per year. Countries whose supplies cannot sustain this figure are considered to experience water stress. A country or region has a water scarcity when the TRWRs is less than 1,000m^3 *per capita* per year and it is absolute scarcity when this number falls below 500m^3 (WB, UN-Water, FAO, 2007).

Accordingly, the OIC Member Countries as a group does not seem to have water scarcity since the average TRWRs *per capita* is 5,469 m^3/yr compared to 1,700m^3/yr. Nevertheless, there are 21 OIC Countries that have TRWRs *per capita* less than 1,700m^3/yr. Pakistan, Lebanon, and Comoros experience water stress. Eighteen member countries have water scarcity.

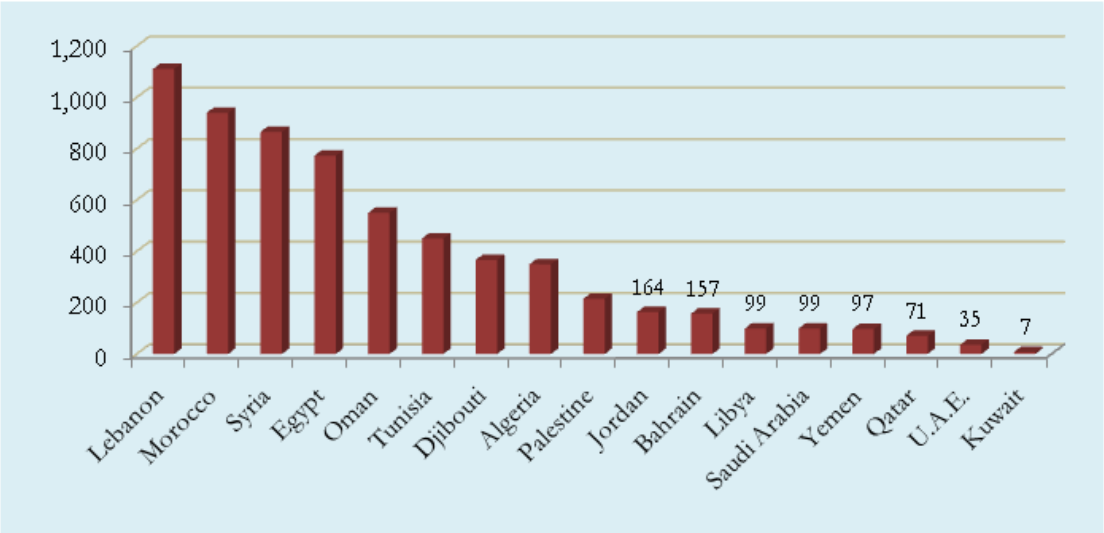
Figure 7: TRWRs per Capita in OIC Countries (m^3 in 2007)



Source: Estimated from FAO AQUASTAT online database

Sixteen countries that have water scarcity are located in MENA. Moreover, 12 of them suffer from absolute scarcity like the Gulf Countries and Jordan.

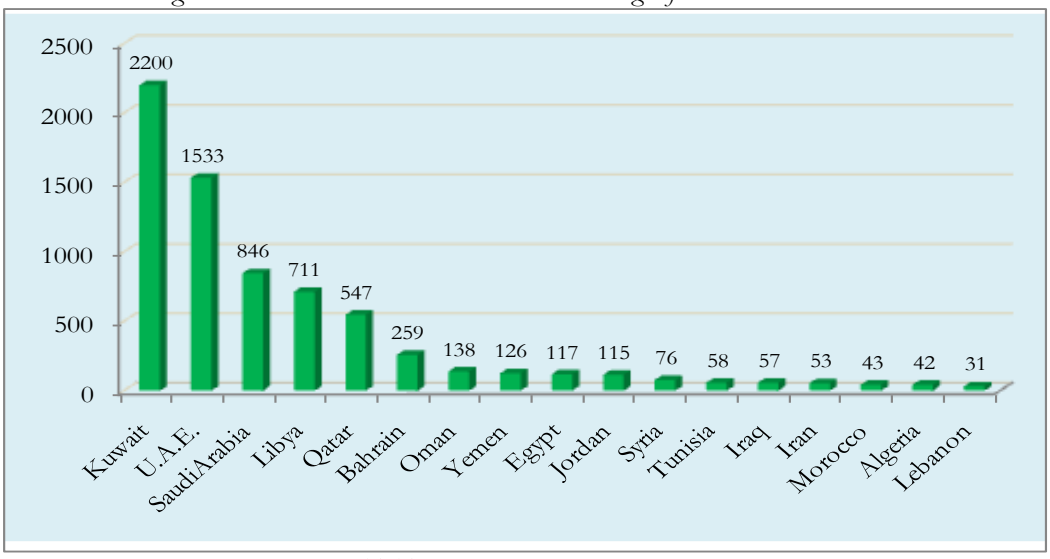
Figure 8: TRWRs per Capita in the Middle East and North Africa, 2007



Source: FAO AQUASTAT online database

Since the demand for water is very high, the total withdrawn water exceeds the TRWRs in most of these countries. As shown in Figure 9, the percentage of total water withdrawal to TRWRs is above 100% in ten countries. Non-renewable groundwater, desalinated water, and treated wastewater are, therefore, used as supplemental water resources in most of these countries.

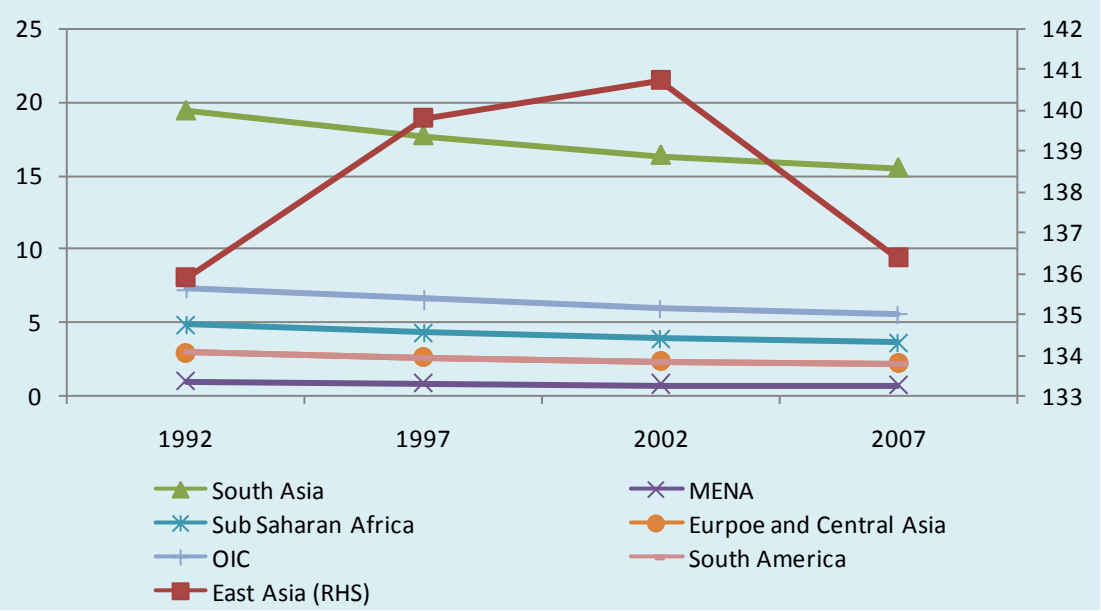
Figure 9: Total Water Withdrawal as a Percentage of TRWRs in MENA



Source: Estimated from FAO AQUASTAT online database, *2002*

For many OIC Member Countries, meeting the increasing water demand for anthropogenic activities is still a serious challenge. The rapid growth of population, which is one of the highest in the world, creates a high demand for domestic use, in addition to the increase of industrial and agricultural needs. It is estimated that the average TRWRs *per capita* in OIC Member Countries has decreased 22.8% since 1992. At Sub-regional level, the TRWRs *per capita* in MENA and SSA have declined 32% and 33% respectively, as shown in Figure 10.

Figure 10: Total Renewable Water Resources per capita in OIC Regions (000m³/yr) (1992-2007)



Source: Estimated from FAO AQUASTAT online data

At individual country level, except Albania, Guyana, and Kazakhstan, other countries have shown a decrease within the range between 11.1%-51.2%. Bahrain and Qatar have shown the sever decline with 50.9% and 51.2% respectively.

In this regard, the trend of using supplement water resources, such as desalinated water, and treated wastewater is rising in some OIC Member Countries, particularly, the Gulf Countries which convert a significant amount of saline water from the sea into drinking-water. In absolute terms, three countries, Saudi Arabia, the United Arab Emirates, and Kuwait; are by far the largest users of desalinated water, accounting for 77% of the total for the MENA (WB, 2007). Saudi Arabia alone accounts for 47%. Moreover, the reuse of treated wastewater is becoming a common practice in the MENA Region for irrigation purposes.

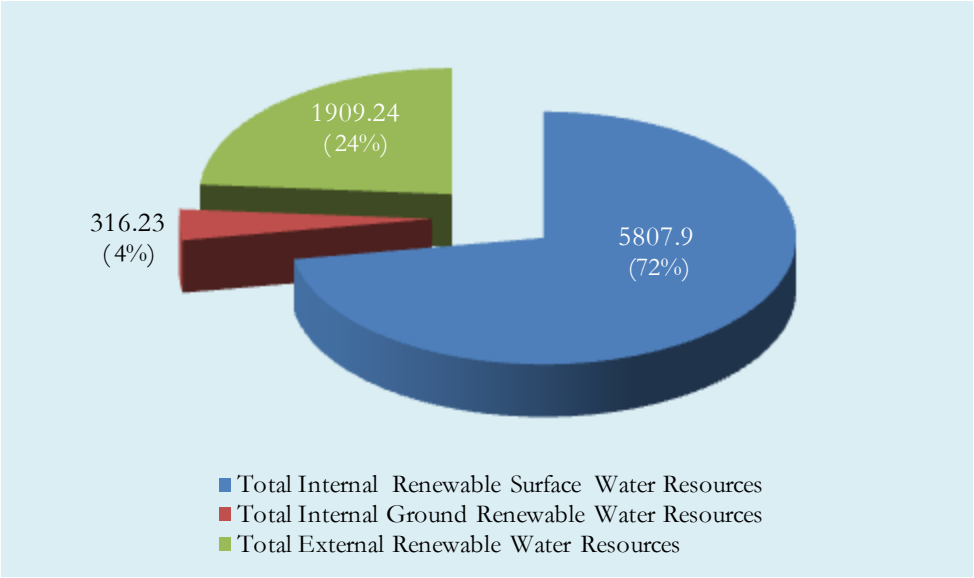
Climate change and global warming accelerate the scarcity of water. The expected increase of temperature will negatively affect water quantity and quality with frequent occurrence of floods and droughts (IPCC, 2007; EUWI, 2008). Climate change is predicted to reduce water availability severely by up to 60% in the coming century. Water shortages are likely to worsen and become critical. Reductions in water availability are likely to have drastic effects on agriculture, economic diversity and productivity, lead to a loss in GDP, displace large numbers of people, and lead to food shortages. The change of climate has already been witnessed. Precipitation has decreased by 4-27% with significant spatial and seasonal variation (IPCC, 2007; UN, 2004).

DEPENDENCY ON EXTERNAL WATER RESOURCES

The OIC Member Countries as a whole has a relatively low dependency rate[1]. This dependency rate is around 24% (Figure 11). However, this ratio is quit high in many member countries.

[1] Dependency ratio is the percentage of external renewable water to the total renewable water.

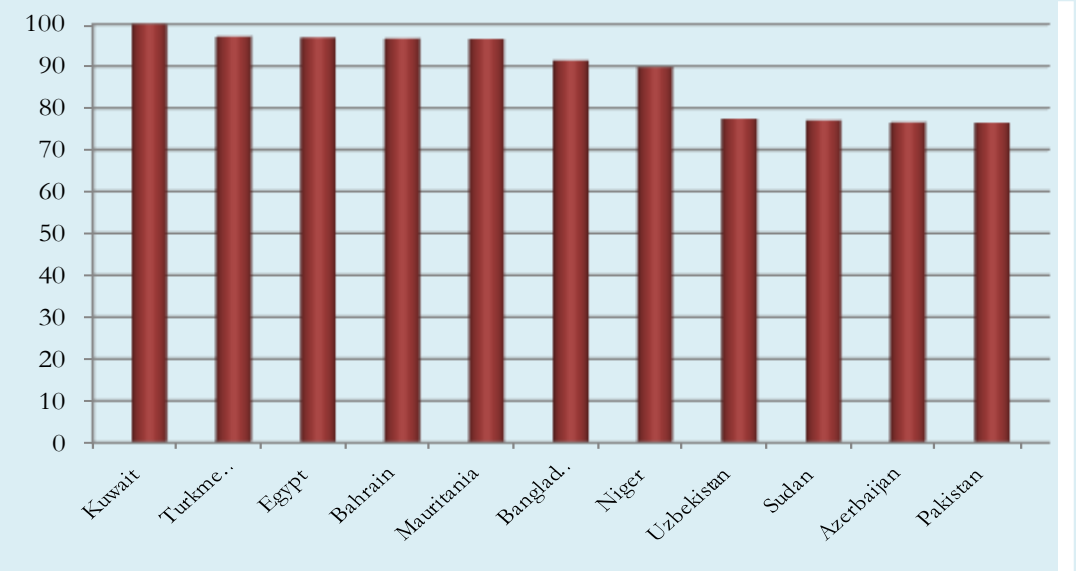
Figure 11: Total Renewable Water Resources in OIC Member Countries (km³)



Source: Calculated from FAO AQUASTAT online database

As shown in Figure 12, Kuwait has 100% dependency on ERWRs. It depends on groundwater flows from Saudi Arabia. Six countries depend for over 90% of their renewable water resources on other countries: Egypt (Nile River), Mauritania (Senegal River), Bangladesh (Ganges River from India) and Turkmenistan (Amu Darya River) and Bahrain (from Saudi Arabia groundwater aquifer).

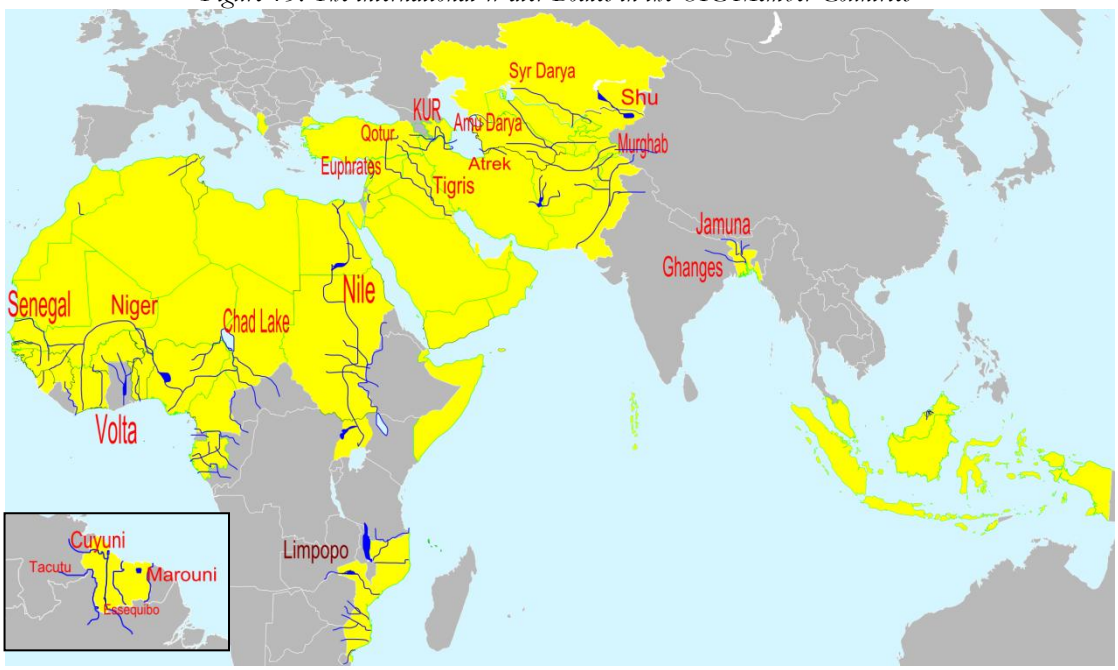
Figure 12: OIC Member Countries with Highest Dependency Rates, 2007



Source: FAO AQUASTAT online database

Many large and networks of minor rivers in addition to shared groundwater aquifers play significant role in water exchange among OIC Member Countries. There are eight main international river basins in the OIC. The Nile, Niger, Senegal, Lake Chad, and Limpopo River Basins lay in African Region; Euphrates and Tigris River Basin, Aral Sea Basin (Amu Darya and Syr Darya Rivers), and Ganges River Basin in Asian Region. As illustrated in Figure 13, few OIC Countries share river basins with countries that are not affiliated to OIC like Bangladesh, Sudan, and Mozambique. However, the other OIC Countries share these resources with countries within the OIC.

Figure 13: The international Water Bodies in the OIC Member Countries



Source: Drawn based on Geology Maps

Since shared surface and ground water resources among geographically adjacent OIC countries are the rule not the exception, and from the political economy perspective, this could potentially augment the difficulty in managing the shared resources in the case when conflicting interests amongst countries emerge. The success in managing the shared resources will depend on the extent to which interests among countries are aligned. Examples of such possible paradigm of political economy are abundant in the context of OIC Member Countries. Countries such as Turkey, Syria, and Iraq meet regularly at both political and technical levels to discuss challenges and abridge differences in national interests in order to maintain adequate intakes of Euphrates and Tigris water for all of them. In the nutshell, the political efforts for transboundary water cooperation are not absent. In fact, it is sometimes a major challenge that exceeds in term of importance supply- and/or demand-related challenges. Policies that are orchestrated by all beneficiaries and reinforced multilaterally based on collective interests are very essential for the sustainability of water resources and need to be given high priority.

INADEQUATE UTILIZATION OF WATER RESOURCES

Most of OIC Countries suffer from water quality deterioration due to the discharge of most of domestic and industrial wastewater without sufficient treatment to water bodies beside the inadequate agricultural practices. Overexploitation of water resources, lack of water networks and sewerage systems maintenance are other major problems in the OIC Member Countries. There are many reasons to slow the mitigation mechanism. They are summarized under three main categories:

- Scattering of responsibilities and lack of coordination between authorities involved in the management of water resources and lack of integration of the various policies: In many OIC Member Countries, 3-4 ministries are responsible for water issues at the same time. For instance, Ministry of Agriculture, Ministry of Irrigation, Ministry of Construction, and municipalities are sharing responsibilities of water issues, and every ministry has its own policies, which makes it a tough task to have an integrated framework for water management.
- Lack of accountability: This occurs when there is absence of a legal framework and transparency between governments and users. In other words, the lack of lax control,

inadequate water pricing, and involvement of the users in water resources planning and management will increase carelessness and have misleading approach for sustainable use of water.

- Lack of qualified staff in charge of water management, and lack of financial capacity, which impedes the implementation of the national plans for an integrated management of water resources and water demand.

WATER AND AGRICULTURE

Agriculture is the most water-consuming sector. Though data regarding the total water resources withdrawn for agriculture is not available for all OIC countries, the existing figures show an average of 74% of the TRWRs. Countries like Afghanistan, Pakistan, Iran, and Somalia consume over than 90% of their TRWRs for agricultural purposes (FAO AQUASTAT, 2007).

Since the common feature of most of OIC Member Countries is the dry climate, it creates the need for irrigation. So far the traditional methods are commonly used for irrigation. Unfortunately, irrigation water efficiency is below 45% in most of OIC Member Countries. While surface irrigation is by far the most widely used system in irrigation, practiced on 87.6% of the total full and partial control irrigation area, the most water-saving system through micro-irrigation techniques is only practiced on 1.4% of the total irrigation area (Dabour, 2006).

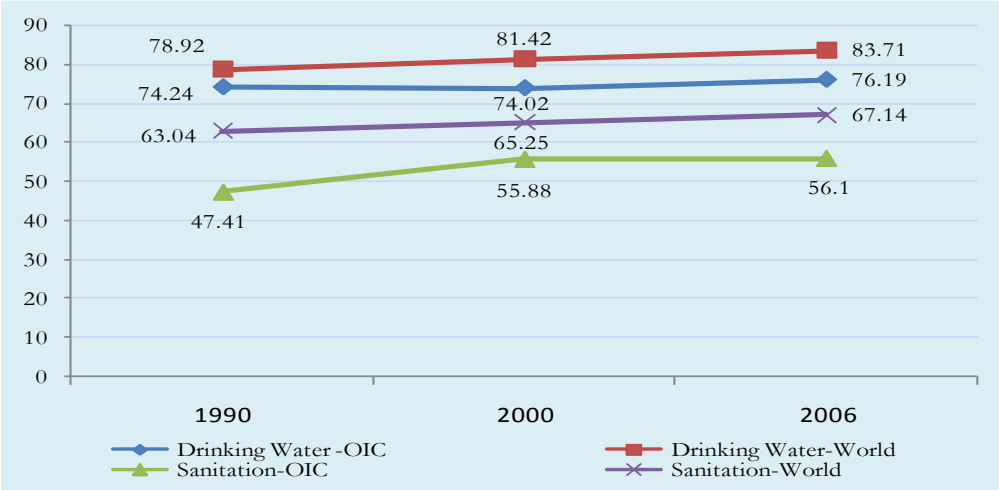
There are several good examples of countries that use advanced irrigation techniques. Saudi Arabia and Libya use sprinkler system approximately 70% and 100% respectively. In United Arab Emirates and Jordan, micro irrigation is used by 59.4% and 56.7% respectively of total irrigated land.

Yet, it is essential for OIC Member Countries to enhance new irrigation policies and practices in order to minimize water-use inefficiency. Efficient water utilization has many positive impacts, such as ensuring water availability for the increasing demand in industrial, domestic sectors and agriculture itself; sustaining food security; minimizing the sensitivity to drought since drought is a frequent phenomenon combined with arid weather.

ACCESS TO DRINKING WATER AND SANITATION

Although access to drinking water and sanitation has been improving in the OIC Members Countries to reach 76.19% and 56.10% in 2006, it is yet below the world average since these indicators are very low in the OIC Least Developed Countries.

Figure 14: Population with Access to Improved Water and Sanitation (%)

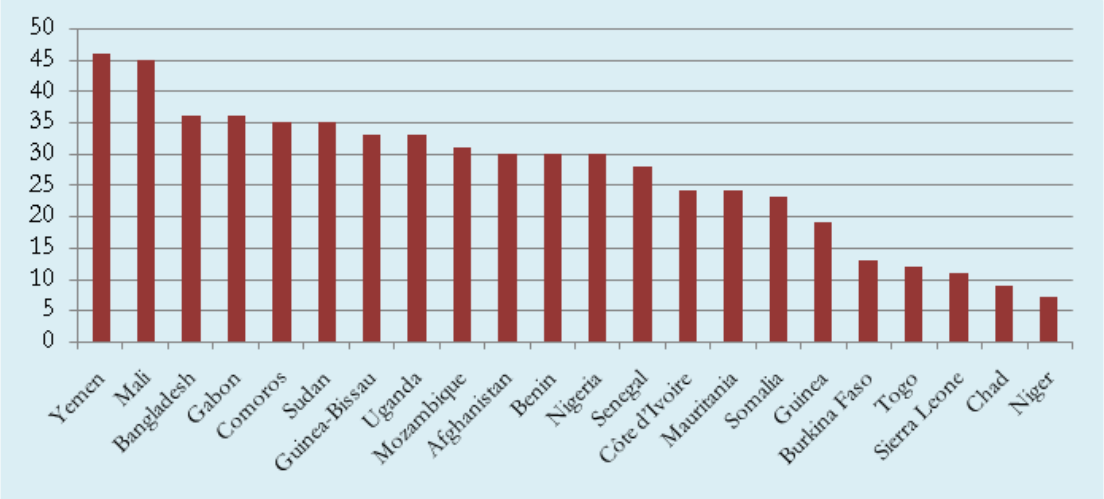


Source: WHO, WHOSIS Online Database.

The access to drinking water is less than 50% of population in Afghanistan, Somalia, Niger, Nigeria, Chad, and Mozambique.

Nevertheless, the access for sanitation is much low behind. It is less than 50% in all the OIC Least Developed Countries.

Figure 15: Access to Sanitation in LDCs, 2006 (%)



Source: *WHO, WHOSIS Online Database*

Unfortunately, in Sub-Saharan Countries still millions of people affected by water-borne diseases occur due to lack of drinking water and sanitation access and inadequate management of natural pounds and swamps. The latest data of FAO shows the number of patients of water-born diseases was around 3 million in Burkina Faso, Cote d'Ivoire and Mauritania in year 2007. According to WHO, the number of patients with Malaria recorded in hospitals reaches 50% in Mozambique and Uganda.

In Bangladesh, 28-35millions of people use groundwater from illegal wells that contaminated naturally with high levels of inorganic Arsenic. The elevated level of Arsenic causes severe dermatologic diseases. More than 1.5million cases of skin lesions are reported every year. Moreover, cancer and some heart diseases are suspected to be aggravated by Arsenic (FAO, 2006).

RECOMMENDATIONS AND POLICY MEASURES

Realizing the necessity to address water-related issues, OIC Water View 2025 was proposed at the session of the OIC Ministerial Meeting in the sideline of the Fifth World Water Forum in March, 2009, in Istanbul. The aim of this view is to put a comprehensive agenda to cope with the increase of water demand in the OIC Member Countries taking into consideration the consequences of climate change on earth including water resources, drought, floods, etc.

Water resource management requires an inter-sectoral and multidisciplinary approach in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Integration across sectors is needed. This integration needs to take into account development, supply, use and demand, and to place the emphasis on people, their livelihood and the ecosystems that sustain them. The integrated policy has two levels:

- At OIC level, member countries need to seek enhancing cooperation in dealing with transboundary water management issues, focusing on negotiations and dialogue and on

the quest to optimize the overall societal benefits of water, and taking into consideration the continuous change of geographic setting of political borders in some regions.

- At national and local level, policies and governance need adapting in order to better account for increased scarcity and address competing uses in a fair and equitable way. The institutional integration of water policies and increased stakeholder involvement in decision-making processes are paramount to this process, focusing on optimal water pricing and public-private partnership. Beside increase awareness and encourage the habit of water and food conservation.

Regarding the issue of climate change and agriculture sector, the following recommendations can be made:

- Measures should be taken with a view to enhance water conservation and increasing the efficient use of water resources, including, inter alia, promoting and providing modern techniques and water-saving technologies of irrigation, mainly through shifting from surface irrigation system to pressurized irrigation.
- Drought contingency plans need to be developed and new related legislations should be adopted at all levels. In this context, applying appropriate water tariffs, introducing new crops that demand less water and promoting dry farming will contribute to the goal of effective utilization of limited water resources.
- Cooperative efforts need to be undertaken within and among OIC Member Countries to tackle the causes and effects of climate change and adapt to future climates with an approach that utilizes the challenge as a reason for cooperation rather than a trigger for conflict. In particular, urgent efforts and measures should be made to curb greenhouse gas emissions in OIC member countries.

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ANNEX

Table 1: Water Indicators in OIC Countries

Country	*Average Precipitation in Depth (mm/yr) 2007*	*TRWRs (km^3)*	*IRWRs (km^3)*	*ERWRs (km^3)*	*TRWRs per Capita (m^3/yr)*	*Dependency Ratio*
Afghanistan	327	65.00	55.00	10.00	2,492	15.39
Albania	1485	41.70	26.90	14.80	13,146	35.49
Algeria	89	11.67	11.25	0.42	350	3.60
Azerbaijan	447	34.68	8.12	26.56	4,125	76.60
Bahrain	83	0.12	0.00	0.11	157	96.55
Bangladesh	2666	1210.64	105.00	1105.64	7,761	91.33
Benin	1039	26.39	10.30	16.09	3,013	60.97
Brunei	2722	8.50	8.50	0.00	22,254	0.00
Burkina Faso	748	12.50	12.50	0.00	871	0.00
Cameroon	1604	285.50	273.00	12.50	15,709	4.38
Chad	322	43.00	15.00	28.00	4,108	65.12
Comoros	900	1.20	1.20	0.00	1,466	0.00
Cote d'Ivoire	1348	81.14	76.84	4.30	4,290	5.30
Djibouti	220	0.30	0.30	0.00	367	0.00
Egypt	51	57.30	1.80	55.50	773	96.86
Gabon	1831	164.00	164.00	0.00	125,113	0.00
Gambia	836	8.00	3.00	5.00	4,810	62.50
Guinea	1651	226.00	226.00	0.00	24,615	0.00
Guinea-Bissau	1577	31.00	16.00	15.00	18,839	48.39
Guyana	2387	241.00	241.00	0.00	326,088	0.00
Indonesia	2702	2838.00	2838.00	0.00	12,400	0.00
Iran	228	137.52	128.50	9.02	1,957	6.56
Iraq	216	75.61	35.20	40.41	2,652	53.45
Jordan	111	0.94	0.68	0.26	164	27.21
Kazakhstan	250	109.61	75.42	34.19	7,157	31.19
Kuwait	121	0.02	0.00	0.02	7	100.00
Kyrgyzstan	533	20.58	46.45	-25.87	3,914	0.00
Lebanon	661	4.50	4.80	-0.30	1,110	0.79
Libya	56	0.60	0.60	0.00	99	0.00
Malaysia	2875	580.00	580.00	0.00	22,211	0.00
Maldives	1972	0.03	0.03	0.00	100	0.00
Mali	282	100.00	60.00	40.00	8,355	40.00
Mauritania	92	11.40	0.40	11.00	3,746	96.49
Morocco	346	29.00	29.00	0.00	940	0.00
Mozambique	1032	217.11	100.30	116.81	10,353	53.80
Niger	151	33.65	3.50	30.15	2,450	89.60
Nigeria	1150	286.20	221.00	65.20	1,978	22.78
Oman	125	1.40	1.40	0.00	550	0.00
Pakistan	494	225.27	55.00	170.27	1,400	76.47
Palestine	402	0.84	0.81	0.03	215	2.99
Qatar	74	0.06	0.06	0.00	71	3.45
Saudi Arabia	59	2.40	2.40	0.00	99	0.00
Senegal	686	38.80	25.80	13.00	3,214	33.51
Sierra Leone	2526	160.00	160.00	0.00	27,861	0.00
Somalia	282	14.70	6.00	8.70	1,741	59.18
Sudan	416	64.50	30.00	34.50	1,711	76.92
Suriname	2331	122.00	88.00	34.00	267,971	27.87
Syria	252	16.80	7.13	9.67	865	72.35
Tajikistan	691	15.98	66.30	-50.32	2,407	16.72
Togo	1168	14.70	11.50	3.20	2,293	21.77
Tunisia	207	4.60	4.20	0.40	450	8.71
Turkey	593	213.56	227.00	-13.44	2,889	1.01
Turkmenistan	161	24.72	1.36	23.36	5,045	97.09
U.A.E.	78	0.15	0.15	0.00	35	0.00
Uganda	1180	66.00	39.00	27.00	2,207	40.91
Uzbekistan	206	50.41	16.34	34.07	1,868	77.37
Yemen	167	2.10	2.10	0.00	97	0.00
OIC		***8033.38***	***6124.13***	***1909.24***	***5,469***	***23.77***

Source: FAO AQUAST online Database

Table 2: The Percentage of Population with Access to Drinking Water and Sanitation in OIC Countries, 2006

Country	Access to Drinking Water	Access to Sanitation
Afghanistan	22	30
Albania	97	97
Algeria	85	94
Azerbaijan	78	80
Bangladesh	80	36
Benin	65	30
Burkina Faso	72	13
Cameroon	70	51
Chad	48	9
Comoros	85	35
Côte d'Ivoire	81	24
Djibouti	92	67
Egypt	98	66
Gabon	87	36
Gambia	86	52
Guinea	70	19
Guinea-Bissau	57	33
Guyana	93	81
Indonesia	80	52
Iraq	77	76
Jordan	98	85
Kazakhstan	96	97
Kyrgyz Republic	89	93
Lebanon	100	-
Libya	-.	97
Malaysia	99	94
Maldives	83	59
Mali	60	45
Mauritania	60	24
Morocco	83	72
Mozambique	42	31
Niger	42	7
Nigeria	47	30
Pakistan	90	58
Qatar	100	100
Senegal	77	28
Sierra Leone	53	11
Somalia	29	23
Sudan	70	35
Suriname	92	82
Syria	89	92
Tajikistan	67	92
Togo	59	12
Tunisia	94	85
Turkey	97	88
Uganda	64	33
United Arab Emirates	100	97
Uzbekistan	88	96
Yemen	66	46

Source: WHO, WHOSIS online Database

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